National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation

Action Agencies: National Marine Fisheries Service (NMFS)
The United States Environmental Protection Agency (EPA)
The Bureau of Indian Affairs (BIA)
The United States Geological Survey (USGS)
The United States Forest Service (USFS)
The United States Fish and Wildlife Service (USFWS)
The Bonneville Power Administration (BPA)

Species/ESUs Affected: Upper Columbia River (UCR) steelhead (*Oncorhynchus mykiss*)
UCR chinook salmon (O. *Tshawytscha*)

Essential Fish Habitat (EFH) Affected: Pacific salmon, groundfish, and coastal pelagic species

Activities Considered:

1. Issuance of Permit No.1114 to the Washington Department of Fish and Wildlife (WDFW).
2. Issuance of Permit No. 1119 to the USFWS.
3. Issuance of Permit No. 1156 to the EPA.
4. Issuance of Permit No. 1194 to NMFS' Northwest Fisheries Science Center (NWFSC).
5. Issuance of Permit No. 1290 to the NWFSC.
6. Issuance of Permit No. 1291 to the USGS.
7. Issuance of permit No. 1322 to the NWFSC.
8. Issuance of Permit No. 1335 to the USFS.
9. Issuance of Permit No. 1366 to the Oregon Cooperative Fish and Wildlife Research Unit (OCFWRU).
10. Issuance of Permit No. 1379 to the Columbia River Inter-Tribal Fish commission (CRITFC).
11. Issuance of Permit No. 1410 to the NWFSC.
12. Issuance of Permit No. 1421 to the USFWS.
13. Issuance of Permit No. 1422 to the USFS.
14. Issuance of Permit No. 1423 to the USFWS.
15. Section 7 consultation on a research action proposed by the CRITFC.

Consultation Conducted by: The Protected Resources Division (PRD), Northwest Region, NMFS
Consultation Number 2003/00481.

This Biological Opinion (Opinion) constitutes NMFS' review of 14 ESA section 10(a)(1)(A) permit actions and one proposed research action that could affect UCR steelhead and chinook. It has been prepared in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.). It is based on information provided in the applications for the proposed permits and permit modifications, published and unpublished scientific information on the biology and ecology of listed salmonids in the action area, and other sources of information. A complete administrative record of this consultation is on file with the PRD in Portland, Oregon.

NMFS concludes that the proposed ESA section 10(a)(1)(A) actions discussed in this biological opinion are not likely to jeopardize the continued existence of endangered UCR spring chinook salmon or endangered UCR steelhead. Further, the activities are not likely to adversely affect any designated EFH.

Approved by: for D. Robert Lohn, Regional Administrator
Date: 6/16/03 (**Expires on:** 12/31/07)

CONSULTATION HISTORY

NMFS proposes to issue 14 permits and permit modifications and thereby authorize the permit holders to conduct scientific research on listed UCR chinook and steelhead. NMFS further proposes to consult on a research action advocated by the CRITFC in the Methow River, Washington. The Northwest Region's PRD decided to group these actions in a single consultation pursuant to 50 CFR 402.14(c) because they are similar in nature and duration and will affect the same listed species. Though some of the proposed permit actions may affect other species as well, this Opinion constitutes formal consultation and an analysis of effects solely for UCR chinook and steelhead.

The first of the permit requests was received in December of 2002. It, and several others (though not all) were deemed incomplete to varying degrees when they arrived at the PRD. After numerous phone calls and e-mails, each of the applications was determined to be complete and was then published in a *Federal Register* notice asking for public comment. The public was given 30 days to comment on each application and, once that period closed, the consultation proper was begun. The full consultation histories for all 15 actions are lengthy and are not directly relevant to the analysis for the proposed actions so they will not be detailed here. Nonetheless, the PRD in Portland, Oregon maintains the complete histories for each proposed action in the administrative record for this consultation.

DESCRIPTION OF THE PROPOSED ACTIONS

Common Elements Among the Proposed Actions

NMFS proposes to issue or modify 14 permits pursuant to section 10(a)(1)(A) of the ESA. All of the permits would authorize take of endangered, naturally-produced and artificially-propagated,[1] UCR spring chinook salmon or endangered, naturally-produced and artificially-propagated UCR steelhead or both.

NMFS proposes that all of the permit actions considered in this Opinion should expire on or before December 31, 2007. Also, in all instances where a permit holder does not expect to kill any juvenile UCR steelhead or chinook during the course of his or her work, the unintentional lethal take figure has been set at one. The reason for this is that unforseen circumstances can

[1] Under NMFS policy, the progeny of hatchery and wild crosses are generally considered listed species for purposes of the ESA (58 FR 17573, April 5, 1993). Artificially-propagated UCR steelhead and UCR spring chinook salmon qualify as listed species under this policy and are therefore considered in the analyses throughout this biological opinion.

arise on occasion, and NMFS has determined it is best in these instances to include modest overestimates of expected take. By doing this, NMFS gives researchers enough flexibility to make in-season research protocol adjustments in response to annual fluctuations in environmental conditions—such as water flows, larger than expected run sizes, etc.—without having to shut down the research because the expected take was exceeded. Also, high take estimates are useful for conservatively analyzing the effects of the actions because it allows accidents that could cause higher-than-expected take levels to be taken into account during the analysis.

Research permits lay out the terms and conditions to be followed before, during, and after the research activities are conducted—as do incidental take statements (ITSs) associated with ESA section 7 consultations. These conditions are intended to (a) manage the interaction between scientists and listed salmonids by requiring that research activities be coordinated among permit holders and between permit holders and NMFS, (b) minimize impacts on listed species, and (c) ensure that NMFS receives information about the effects the permitted activities have on the species concerned. The following conditions are common to all of the permits consulted upon in this Opinion (the conditions are largely the same for the CRITFC research action and are stated in the ITS).

In all cases, the permit holder must:

1. The permit holder must ensure that listed species are taken only at the levels, by the means, in the areas and for the purposes stated in the permit application, and according to the terms and conditions in this permit.

2. The permit holder must not intentionally kill or cause to be killed any listed species unless the permit specifically allows intentional lethal take.

3. The permit holder must handle listed fish with extreme care and keep them in cold water to the maximum extent possible during sampling and processing procedures. When fish are transferred or held, a healthy environment must be provided; e.g., the holding units must contain adequate amounts of well-circulated water. When using gear that captures a mix of species, the permit holder must process listed fish first to minimize handling stress.

4. The permit holder must stop handling listed juvenile fish if the water temperature exceeds 70 degrees Fahrenheit at the capture site. Under these conditions, listed fish may only be visually identified and counted.

5. If the permit holder anesthetizes listed fish to avoid injuring or killing them during handling, the fish must be allowed to recover before being released. Fish that are only counted must remain in water and not be anesthetized.

6. The permit holder must use a sterilized needle for each individual injection when passive integrated transponder tags (PIT-tags) are inserted into listed fish.

7. If the permit holder incidentally captures any listed adult fish while sampling for juveniles, the adult fish must be released without further handling and such take must be reported.

8. The permit holder must exercise care during spawning ground surveys to avoid disturbing listed adult salmonids when they are spawning. Researchers must avoid walking in salmon streams whenever possible, especially where listed salmonids are likely to spawn. Visual observation must be used instead of intrusive sampling methods, especially when just determining presence of anadromous fish.

9. The permit holder using backpack electrofishing equipment must comply with NMFS' Backpack Electrofishing Guidelines (June 2000) available at http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/final4d/electro2000.pdf

10. The permit holder must obtain approval from NMFS before changing sampling locations or research protocols.

11. The permit holder must notify NMFS as soon as possible but no later than two days after any authorized level of take is exceeded or if such an event is likely. The permit holder must submit a written report detailing why the authorized take level was exceeded or is likely to be exceeded.

12. The permit holder is responsible for any biological samples collected from listed species as long as they are used for research purposes. The permit holder may not transfer biological samples to anyone not listed in the application without prior written approval from NMFS.

13. The person(s) actually doing the research must have a copy of this permit while conducting the authorized activities.

14. The permit holder must allow any NMFS employee or representative to accompany field personnel while they conduct the research activities.

15. The permit holder must allow any NMFS employee or representative to inspect any records or facilities related to the permit activities.

16. The permit holder may not transfer or assign this permit to any other person as defined in Section 3(12) of the ESA. This permit ceases to be in effect if transferred or assigned to any other person without NMFS' authorization.

17. NMFS may amend the provisions of this permit after giving the permit holder reasonable notice of the amendment.

18. The permit holder must obtain all other Federal, state, and local permits/authorizations needed for the research activities.

19. On or before January 31st of every year, the permit holder must submit to NMFS a post-season report in the prescribed form describing the research activities, the number of listed fish taken and the location, the type of take, the number of fish intentionally killed and unintentionally killed, the take dates, and a brief summary of the research results. Falsifying annual reports or permit records is a violation of this permit.

20. If the permit holder violates any permit term or condition they will be subject to any and all penalties provided by the ESA. NMFS may revoke this permit if the authorized activities are not conducted in compliance with the permit and the requirements of the ESA or if NMFS determines that its ESA section 10(d) findings are no longer valid.

It should be noted that in this instance "permit holder" means the permit holder or any employee, contractor, or agent of the permit holder.

Some of the activities identified in the proposed permit actions will be funded by NMFS, the EPA, the BIA, the USGS, the USFS, and the USFWS. Although these agencies are also responsible for complying with section 7 of the ESA because they are funding activities that may affect listed species, this consultation examines the actual activities they propose to fund and thus will fulfill their section 7 consultation requirement.

Finally, NMFS will use the annual reports to monitor the actual number of listed fish taken annually in the scientific research activities and will adjust annual permitted take levels if they are deemed to be excessive or if cumulative take levels rise to the point where they are detrimental to the listed species.

The Individual Permits

Some of the permit requests described in the following pages seek to take other listed salmonids along with UCR spring chinook and steelhead (e.g., Middle Columbia River steelhead). The effects of taking those other species are described in other biological opinions and are not relevant to this consultation. Therefore, only those portions of the proposed research activities that would affect UCR spring chinook and steelhead are discussed here.

Permit 1114

The WDFW is requesting a 5-year permit renewal for a study that would annually take juvenile natural and artificially- propagated, endangered UCR spring chinook salmon; and juvenile and adult, natural and artificially propagated, endangered UCR steelhead in the State of Washington. Under this permit, the WDFW would capture juvenile, artificially propagated and natural UCR spring chinook salmon and steelhead as part of a long-term, ongoing smolt monitoring program at Rock Island Dam on the Columbia River. The original permit was in place for five years (63 FR 20169) with three modifications (63 FR 43381, 65 FR 15314, 66 FR 38641); it expired on December 31, 2002. Under the new permit (as with the old) the captured smolts would be held for as long as 24 hours and all would be anesthetized, sampled for data relating to their species, size, origin (hatchery or natural), and examined for the presence of a coded wire tag (CWT) or passive integrated transponder (PIT) tag. Some of the captured fish would be examined for evidence of gas bubble trauma (GBT) and others would be implanted with a PIT tag. All captured fish would be allowed to recover before being released in the dam's tailrace. The WDFW also expects to capture a few downstream-migrating steelhead kelts during the course of the trapping operation. These fish would simply be anesthetized and immediately moved to the lower sections of the adult fishway where they could recover on their own and continue their migration. The WDFW does not intend to kill any of the fish being captured, but a small percentage may die as a result of the research activities.

The purpose of the research is to provide important information regarding what effects the annual mid- and upper (Columbia) river water allocation budget has on listed salmonids. The data being collected would be used to assess the effects of the water allocation plan and thereby improve smolt migration conditions (e.g., through releasing adequate amounts of upstream water during the migration period) and increase listed spring chinook and steelhead survival rates. Another important objective of the program is to help resource managers develop the Basin-wide database for PIT-tagged salmonids and thus increase what is known about smolt migration timing and behavior in the Columbia River system.

Permit 1119

The U.S. Fish and Wildlife Service (USFWS) is seeking a five-year permit covering five studies that, among them, would annually take adult and juvenile endangered UCR spring chinook salmon (natural and artificially propagated) and adult and juvenile endangered UCR steelhead (natural and artificially propagated) at various points in the Wenatchee, Entiat, Methow, Okanogan, and Yakima River watersheds and other points in eastern Washington State. The research was originally conducted under Permit 1119, which was in place for five years (63 FR 27055) with two amendments (65 FR 11288, 66 FR 38641); it expired on December 31, 2002. Over the years, there have been some changes in the research and they are reflected in this proposal (e.g., the aforementioned amendments), nonetheless, the proposed projects are largely

continuations of ongoing research. They are: Study 1—Recovery of ESA-listed Entiat River Salmonids through Improved Management Actions; Study 2—From extirpation to colonization: an attempt to restore salmon back to their former streams; Study 3—Entiat Basin Spawning Ground Surveys; Study 4—Snorkel Surveys in the Wenatchee, Entiat, Methow, Okanogan, and Yakima Watersheds and Other Waterways of Eastern Washington; Study; 5—Fish Salvage Activities in the Wenatchee, Entiat, Methow, Okanogan, and Yakima Watersheds and other Waterways of Eastern Washington. Under these studies, listed adult and juvenile salmon would be variously (a) captured (using nets, traps, and electrofishing equipment) and anesthetized; (b) sampled for biological information and tissue samples; (c) tagged with passive integrated transponders (PIT tags) or other identifiers; and (e) released.

The research has many purposes and would benefit listed salmon and steelhead in different ways. In general, the purpose of the research is to (a) gain current information on the status and productivity of various fish populations (to be used in determining the effectiveness of restoration programs); (b) collect data on the how well artificial propagation programs are helping salmon recovery efforts (looking at hatchery and wild fish interactions); (c) support the aquatic species restoration goals found in several regional plans; and (d) fulfill ESA requirements for several fish hatcheries. The fish would benefit through improved recovery actions, better designs for hatchery supplementation programs, and by being rescued outright when they are stranded by low flows in Eastern Washington streams. The USFWS does not intend to kill any of the fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1156

The U.S. Environmental Protection Agency (EPA) in Corvallis, Oregon (OR) requests a 5-year permit to annually take juvenile and adult threatened LCR steelhead; threatened MCR steelhead; endangered naturally-produced and artificially-propagated UCR steelhead; threatened SR steelhead; threatened UWR steelhead; threatened SR (S/S) chinook salmon; threatened SnR fall chinook salmon; threatened LCR chinook salmon; threatened UWR chinook salmon; endangered naturally-produced and artificially propagated UCR spring chinook salmon; threatened naturally-produced and artificially propagated PS chinook salmon; threatened OC coho salmon; and threatened SONCC coho salmon associated with research designed to assess species status and trends in randomly-selected river systems in Oregon, Washington, and Idaho. The EPA intends to conduct annual surveys for fish, macroinvertebrate, algae, and microbial assemblages as well as physical and chemical habitat conditions in randomly selected river-systems in Oregon, Washington, and Idaho. Listed fish will be captured by electrofishing (using backpack or raft-mounted gear), sampled for biological information, and released. The research will benefit the listed species by providing baseline information about water quality in the study areas and will also support enforcement of the Clean Water Act in those river systems where listed fish are present. Dynamac Corporation, U.S. Geological Survey Biological Resources Division, Idaho

Department of Environmental Quality, and Washington Department of Ecology will be cooperators in the proposed EPA research. The EPA requests that the cooperators' biologists be authorized as agents of the EPA in conducting the research.

Permit 1194

The Northwest Fisheries Science Center (NWFSC) in Seattle, Washington is requesting a five-year permit to annually take adult endangered UCR steelhead, adult endangered UCR spring chinook salmon, and adult threatened SR spring/summer chinook salmon during a study designed to evaluate passive integrated transponder tag (PIT) interrogation systems at Bonneville Dam on the Columbia River. Permit 1194 has been in place for nearly five years, but it is due to expire on December 31, 2003. The NWFSC proposes to continue to capture adult fish (using traps at Bonneville Dam), and then anesthetize, tag, release, and monitor them with video cameras.

The objectives of the study are to evaluate the ability of the prototype tag detection systems to detect PIT-tagged adult salmon passing through the facility and evaluate the effects of the detection system on adult behavior as they approach and pass through it. The NWFSC does not intend to kill any of the fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1290—Modification 1

The NWFSC, in Seattle, Washington, is requesting a modification to permit 1290 that would allow them to increase the number of fish taken in their research. Under the modification, the NWFSC would increase their annual take of juvenile threatened SR spr/sum chinook salmon (natural and artificially propagated); threatened SR fall chinook salmon; endangered UCR chinook salmon (natural and artificially propagated); threatened LCR chinook salmon; endangered UCR steelhead (natural and artificially propagated); and threatened MCR steelhead during the course of research being conducted in the Columbia River estuary. The NWFSC proposes to capture, handle, and release listed salmonids, and while most of the fish would be unharmed, some would die during the course of the research and a small number of them would be intentionally killed. Purse seines or beach seines would be the primary capture method. Captured fish would be anesthetized, identified, and measured.

The purpose of the research is to evaluate the importance of the Columbia River estuary to baitfish populations and salmonid marine survival, and the role of disease as a factor affecting survival of juvenile salmonids in the estuarine and marine environment. The research would benefit listed salmonids by contributing information on the extent to which baitfish populations

and diseases affect the growth and survival of juvenile salmonids in the estuarine and early ocean environments.

Permit 1291—Modification 2

The United States Geological Survey (USGS) is requesting a modification to Permit 1291 that would allow them to use McNary Dam on the Columbia River as a possible alternate collection point for some of the fish used in their research. Under the modification, the USGS would annually take juvenile endangered UCR chinook salmon (natural and artificially propagated); endangered UCR steelhead (natural and artificially propagated). Under the modification, the listed juvenile fish would be either (1) captured by Smolt Monitoring Program (SMP) personnel at John Day Dam (and, if necessary at Bonneville and McNary Dams) handled, and released or (2) captured by SMP personnel and given to USGS personnel and implanted with radio transmitters, transported, held for as long as 24 hours, released, and tracked electronically. The USGS requests that SMP personnel be allowed to act as agents of the USGS under the proposed permit. The USGS does not intend to kill any of the fish being captured, but a small percentage may die as a result of the research activities.

The purpose of the research is to monitor (using radio telemetry) juvenile fish movement, distribution, behavior, and survival in the Columbia River. The research would benefit listed salmonids by providing information on spill effectiveness, forebay residence times, and guidance efficiency under various flow regimes that would allow Federal resource managers to adjust bypass/collection structures and thereby optimize downriver migrant survival at the hydropower projects.

Permit 1322—Modification 2

The NWFSC is requesting that NMFS modify Permit 1322 to increase the annual number of listed fish taken in their research. Under the modification, the NWFSC would increase their annual take of juvenile threatened SR spring/summer chinook salmon (natural and artificially propagated); threatened SR fall chinook salmon; endangered UCR chinook salmon (natural and artificially propagated); threatened LCR chinook salmon, threatened UWR chinook salmon, and threatened CR chum salmon while conducting research in the Columbia River estuary. The NWFSC proposes to capture, handle, and release listed salmonids, and while most of the fish would be unharmed, some would die during the course of the research and a small number of them would be intentionally killed. Purse seines, trap nets, and beach seines would be used to capture the fish. Captured fish would be anesthetized, identified, sampled for tissues, and measured. Some fish would be sacrificed to confirm species identification, catch composition, food habits, and timing of estuarine entry. The NWFSC is also requesting an increase in the number of fish that may unintentionally be killed during the research.

The purposes of the research are to (1) determine the presence and abundance of fall and spring chinook salmon, coho salmon, and chum salmon in the estuary and Lower Columbia River; (2) determine the relationship between juvenile salmon and Lower Columbia River estuarine habitat; and (3) obtain information about flow change, sediment input, and habitat availability for the development of a numerical model. The research would benefit listed fish by serving as a basis for estuarine restoration and preservation plans. The NWFSC requests authorization to transfer fish tissue samples to the University of Washington, College of Ocean and Fisheries, School of Fisheries and Aquatic Sciences; Oregon State University, Hatfield Marine Science Center; and Washington Department of Fish and Wildlife.

Permit 1335-Modification 2

The USDA Forest Service (USFS) in Corvallis, Oregon is requesting that Permit 1335 be modified to allow them to annually take juvenile endangered UCR chinook (artificially propagated) and juvenile endangered UCR steelhead (artificially propagated) in randomly chosen sites in watersheds of the upper Columbia River subbasin. The USFS proposes to capture (using backpack electrofishing), anesthetize, measure, and release listed salmonids.

The purposes of the study are to assess watershed conditions and factors limiting salmonid health and production, and evaluate watershed health under the Northwest Forest Plan. The activities will benefit listed fish by generating information to improve forest management. The USFS does not intend to kill any of the listed fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1366—Modification 1

The Oregon Cooperative Fish and Wildlife Research Unit (OCFWRU) and the Idaho Cooperative Fish and Wildlife Research Unit (ICFWRU) are requesting a modification to a five-year permit covering four studies that, among them, would annually take a number of species including juvenile endangered UCR spring chinook salmon (natural and artificially propagated) and juvenile endangered UCR steelhead (natural and artificially propagated) at various dams on the Columbia and Snake Rivers. The research is largely a continuation of four ongoing studies (with some alteration in take numbers). They are: Study 1—Evaluation of Comparative Survival of In-river Passage and Multiple Bypassed Juvenile Salmon; Study 2—Evaluation of Delayed Mortality in the Near-ocean Environment Following Passage Through the Columbia river Hydropower System; Study 3—Evaluation of Survival and Adult Return Rate of Transported Juvenile Salmon Compared to In-river Migrating Fish; Study 4—Evaluation of Migration and Survival of Juvenile Salmonids Following Transportation. Under these studies, juvenile listed salmon would be variously (a) captured using lift nets or dipnets at the dams (or acquired from Columbia River Smolt Monitoring Program or NMFS personnel at Bonneville Dam), (b)

sampled for biological information or tagged with radiotransmitters, and (c) released. Some fish would be purposefully sacrificed as well.

The research has many purposes and would benefit listed salmon and steelhead in different ways. In general, the purpose of the research is to compare biological and physiological indices of wild and hatchery juvenile fish exposed to stress during bypass, collection, and transportation activities at the dams. The research will benefit the listed species by helping determine what effects the dams and their associated structures and management activities have on the outmigrating salmonids and using that information modify those factors in ways that increase salmonid survival.

Permit 1379

The Columbia River Inter Tribal Fish Commission (CRITFC) is requesting a five-year permit covering three study projects that, among them, would annually take a number of listed species including natural adult and natural and artificially propagated juvenile endangered UCR spring chinook salmon and adult and juvenile endangered UCR steelhead (natural and artificially propagated) at various points in the Columbia, Wenatchee, and Methow Rivers in Washington State. The research was originally conducted under Permit 1134, which was in place for five years (63 FR 30199) with one amendment (67 FR 43909); it expired on December 31, 2002. Over the years, there have been some changes in the research and they are reflected in this proposal (e.g., the aforementioned amendment and some reallocation of research activities and their associated take to this and other permits), nonetheless, the proposed projects are largely continuations of ongoing research. They are: Project 1—Juvenile Upriver Bright Fall Chinook Sampling at the Hanford Reach (does not directly target a listed species but would indirectly take them); Project 2—Adult Chinook, Sockeye, and Coho Sampling at Bonnevile Dam; and Project 3—Adult Sockeye Sampling at Tumwater Dam, Wenatchee River (does not directly target a listed species but would indirectly take them). Under these tasks, listed adult and juvenile salmon would be variously (a) captured (using seines, trawls, traps, hook-and-line angling equipment, and electrofishing equipment) and anesthetized; (b) sampled for biological information and tissue samples, (c) or tagged with radio transmitters or other identifiers, (e) and released.

The research has many purposes and would benefit listed salmon and steelhead in different ways. In general, the purpose of the research is to gain current information on the status and productivity of various fish populations, collect data on migratory and exploitation (harvest) patterns, and develop baseline information on various population and habitat parameters in order to guide salmonid restoration strategies—all of which are of use on their own, but most of which are being done in accordance with specific requirements of the U.S.– Canada Pacific Salmon Treaty. The research would continue to benefit listed fish by helping managers set in-river and ocean harvest regimes so that they have minimal impacts on listed populations, prioritize

projects in a way that gives maximum benefit to listed species, and design strategies and activities to help recover them. The CRITFC does not intend to kill any of the fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1410

The NWFSC in Seattle, Washington (WA) is requesting a 5-year permit to annually take adult UCR spring chinook (artificially propagated), juvenile UCR spring chinook salmon (natural and artificially propagated), and juvenile UCR steelhead (artificially propagated). The NWFSC proposes to investigate the distribution, abundance, condition and health of juvenile salmon in relation to physical and biological oceanographic conditions in the Columbia River plume and surrounding ocean environment to better understand factors controlling estuarine and marine survival. The study will provide information to help predict and forecast survival potential as a function of easily measured indices of plume and ocean conditions. Further, the information will help hydropower operators develop a set of hydropower management scenarios that could benefit survival, growth, and health of juvenile salmon by changing the dynamics of the Columbia River plume. Listed fish will be collected with purse seines and trawl nets, sampled for biological data, and released. The requested juvenile fish would be sacrificed for endocrine assessments, genetic stock identification, pathogen prevalence and intensity, otolith and stomach content analysis, and histopathological attributes.

Permit 1421

The USFWS in Vancouver, Washington is requesting a three-year permit to annually take adult and juvenile endangered SR sockeye salmon; adult and juvenile endangered UCR spring chinook salmon (natural and artificially propagated); adult and juvenile endangered UCR steelhead (natural and artificially propagated); adult and juvenile threatened SR fall chinook salmon; adult and juvenile threatened SR spring/summer chinook salmon (natural and artificially propagated); adult and juvenile threatened SR steelhead; adult and juvenile threatened MCR steelhead; adult and juvenile threatened LCR chinook salmon; adult and juvenile threatened LCR steelhead; and adult and juvenile threatened CR chum salmon during the course of a study in the Franz Lake National Wildlife Refuge on the Lower Columbia River. The USFWS proposes to capture (using boat and backpack electrofishing, fyke nets, and minnow traps), anesthetize, measure, check for tags, mark, sample for stomach content, and release listed salmonids.

The objectives of the study are to (1) document fish species in the refuge, (2) evaluate fish distribution relative to habitat features, and (3) describe fish diets in the refuge. The study will be coordinated with a mosquito control study conducted by the Oregon Cooperative Fish and Wildlife Research Unit. The study will benefit listed fish by generating information on the effects of mosquito control on salmonids and salmonid prey species, and the spacial and

temporal relations among fish distribution, fish diets, and areas typically treated to control mosquitos. The USFWS does not intend to kill any of the listed fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1422

The USFS is requesting a five-year permit to annually take juvenile endangered UCR chinook salmon, juvenile endangered UCR steelhead, and juvenile threatened MCR steelhead during research activities taking place at various points in the Yakima, Methow, Entiat, and Wenatchee River drainages in Washington State. The fish would be captured (using minnow traps, hook-and-line angling, and electrofishing equipment), identified, and immediately released. The purpose of the research is to determine fish distribution in the subbasins listed above. The research will benefit the fish by giving land managers information they need in order to design forest management activities (e.g., timber sales, grazing plans, road building) in such a way as to conserve listed species. The USFS does not intend to kill any of the listed fish being captured, but a small percentage may die as an unintended result of the research activities.

Permit 1423

The USFWS is requesting a three-year permit to annually take juvenile endangered UCR steelhead and juvenile endangered UCR chinook (naturally propagated) at points near Icicle Creek and Entiat River National Fish Hatcheries in Washington State. The fish would be captured (using seines, minnow traps, a screw trap, electrofishing, and hook-and-line angling), anesthetized, measured, and killed. It is also likely that a small number of the fish being captured—over and above those that would be sacrificed—would unintentionally be killed. Several samples would then be taken from the fish and used to determine whether any disease—viral or bacterial—was present in the population.

The purpose of the research is to determine if there are any interactions between wild and hatchery fish in terms of disease transmission and to gather baseline information on pathogen presence in the local fish populations. The research would benefit listed fish by increasing our knowledge of disease presence and transmission in the UCR and thereby help managers reduce the risks associated with those diseases.

Research Action 1

Under this action, CRITFC proposes to capture, handle, and release UCR spring chinook and steelhead during research activities designed to evaluate freshwater and ocean life history parameters in order to assess the status (abundance and productivity) of naturally spawning UCR summer chinook. The research would take place for at least three years and may be extended

(though that will require another consultation). The researchers will observe returning adults and capture outmigrating smolts in a screw trap to measure stock performance and population health parameters such as smolt abundance, spawner abundance, habitat quality, quantity and distribution, and age structure. Eventually, these data will be used to assess the condition of UCR summer chinook salmon, and to guide restoration strategies and escapement goal management. The research does not directly target UCR spring chinook or steelhead, but some would incidentally be taken, and some would be killed during the process.

Adults

To estimate adult UCR summer chinook escapement in the Methow River, the researchers will use tower-count methods: Light-colored panels will be placed along the bottom of the river just downstream from the counting structures to improve visibility of fish moving and to serve as a visual guideline to quantify passage. Lights will be suspended over panels to provide illumination during evening hours. To minimize any avoidance behaviors associated with artificial substrate or illumination, panels and overhanging lights will be uniformly distributed.

A suitable counting site located ~3.5 miles upstream of the river mouth has been selected based on the physical character of the river (width, depth, laminar flow, uniformly-sized substrate), its location downstream of most significant spawning grounds, and access. This site has the added advantage of a steep cliff wall lining the right bank (looking downstream), which will provide a good vantage point for counting fishes without the use of scaffolding.

There will be sixteen 8-hour shifts covered per week; non-counting shifts will vary each week to encompass any variability in passage due to time of day. A field biologist and three technicians will be assigned to the project. Each technician will work five 8-hour shifts per week; the field biologist will be assigned to one shift per week and will also participate in independent counts with all technicians to validate consistency between counters. To minimize eyestrain, personnel will count the number of fishes moving upstream and downstream for a 10-minute period every half hour. The total number of fish passing over the panels will be recorded as net counts (fish moving upstream minus fish moving downstream).

Juveniles

To estimate the production base for UCR summer chinook, the researchers will trap the downstream migrants in an 8-foot diameter rotary-screw trap located near the mouth of the Methow River. Collected data will be used to generate daily estimates of abundance, which will then be used to derive an index of juvenile production for fish emigrating during the sample period. Time of passage curves will be constructed to further discriminate between chinook

stocks. Data will also be collected on the physical characteristics of the sample sites (i.e., discharge).

When river conditions are conducive to trap operation, the migrant trap would be in operation 24 hours a day from mid-April (except in 2003, when it would be mid-June) through August. The trap would be sampled on a daily basis. Trap efficiency tests will be conducted using juvenile fish from both hatchery and wild origins, and trap efficiency would be calculated on a weekly basis by releasing known numbers of marked smolts upstream of the trap. The captured UCR summer chinook may be genetically sampled or receive a CWT or PIT-tag. Any UCR spring chinook or steelhead captured during this portion of the research would be anesthetized along with the summer chinook, examined for condition, measured, allowed to recover, and released.

Though the research doesn't directly target listed species, it may benefit them by helping determine what habitat parameters may limit production in the Methow River.

The Action Areas

The action area is defined as the geographic extent of all direct and indirect effects of a proposed agency action [50 CFR 402.02 and 402.14(h)(2)]. For the purposes of this opinion—and for research activities targetting endangered UCR spring chinook salmon—the action area includes all river reaches accessible to chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Also included are adjacent riparian zones, as well as mainstem river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam. Excluded are tribal lands and areas above specific dams (e.g., Lake Chelan hydropower project) or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for the UCR spring chinook salmon ESU comprise approximately 7,003 square miles in Washington. The following counties lie partially or wholly within these basins: Chelan, Douglas, Kittitas, and Okanogan. Critical habitat was designated for UCR spring chinook salmon in 2000 when NMFS published a final rule in the *Federal Register* (NOAA 2000). However, the critical habitat designation for UCR spring chinook salmon was vacated and remanded to NMFS for new rulemaking pursuant to a court order in May 2002. In lieu of a new rule designating critical habitat for UCR spring chinook salmon, this consultation will include an evaluation of the effects of the proposed actions on the species' habitat to determine whether those actions are likely to jeopardize the continued existence of the species.

The action area for endangered UCR steelhead research activities includes all river reaches accessible to steelhead in Columbia River tributaries upstream of the Yakima River and

downstream of Chief Joseph Dam in Washington. Also included are adjacent riparian zones, as well as mainstem river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are tribal lands and areas above specific dams (e.g., Lake Chelan hydropower project) or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for the UCR steelhead ESU comprise approximately 9,545 square miles in Washington. The following counties lie partially or wholly within these basins: Chelan, Douglas, Grant, Kittitas, Okanogan, and Yakima. Critical habitat was designated for UCR steelhead in 2000 when NMFS published a final rule in the *Federal Register* (NOAA 2000). However, the critical habitat designation for UCR steelhead was vacated and remanded to NMFS for new rulemaking pursuant to a court order in May 2002. In lieu of a new rule designating critical habitat for UCR steelhead, this consultation will include an evaluation of the effects of the proposed actions on the species' habitat to determine whether those actions are likely to jeopardize the continued existence of the species.

STATUS OF THE SPECIES UNDER THE ENVIRONMENTAL BASELINE

In order to describe a species' status, it is first necessary to define precisely what "species" means in this context. Traditionally, one thinks of the ESA listing process as pertaining to entire taxonomic species of animals or plants. While this is generally true, the ESA also recognizes that there are times when the listing unit must necessarily be a subset of the species as a whole. In these instances, the ESA allows a "distinct population segment" (DPS) of a species to be listed as threatened or endangered. UCR steelhead and spring chinook are just such DPSs and, as such, are for all intents and purposes considered "species" under the ESA.

NMFS developed the approach for defining salmonid DPSs in 1991 (Waples 1991). It states that a population or group of populations is considered distinct if they are "substantially reproductively isolated from conspecific populations," and if they are considered "an important component of the evolutionary legacy of the species." A distinct population or group populations is referred to as an evolutionarily significant unit (ESU) of the species. Hence, UCR steelhead constitute an ESU of the species *O. mykiss,* and UCR spring chinook are an ESU of *O. Tshawytscha*.

On March 24, 1999, NMFS listed UCR spring chinook salmon as an endangered species under the ESA (NOAA 1999). In its final listing determination, NMFS concluded that the UCR spring chinook salmon ESU is in danger of extinction throughout all or a significant portion of its range. NMFS also determined that six hatchery stocks in the UCR Basin (Chiwawa, Methow, Twisp, Chewuch, and White Rivers and Nason Creek) should be considered part of the ESU because they are currently essential for the recovery of the ESU. The WDFW operates the hatchery programs for listed UCR spring chinook salmon.

On August 18, 1997, NMFS listed UCR steelhead as an endangered species under the ESA (NOAA 1997). NMFS concluded that the UCR steelhead ESU is in danger of extinction throughout all or a significant portion of its range. NMFS also determined that one hatchery stock in the upper Columbia River Basin, the Wells Hatchery stock, should be considered part of the ESU because it is currently essential for the recovery of the ESU (NOAA 1997). The WDFW operates the Wells Hatchery steelhead program.

The UCR spring chinook and steelhead were listed because NMFS determined that a number of factors—both environmental and demographic—had caused them to decline to the point where they were likely to become extinct within the foreseeable future. These factors for decline affect UCR chinook and steelhead biological requirements at every life stage and they arise from a number of different sources. This section of the Opinion explores those effects and defines the context within which they take place.

Species/ESU Life History

Chinook

Chinook salmon is the largest of the Pacific salmon. The species' distribution historically ranged from the Ventura River in California to Point Hope, Alaska, in North America, and in northeastern Asia from Hokkaido, Japan, to the Anadyr River in Russia (Healey 1991). Additionally, chinook salmon have been reported in the Mackenzie River area of northern Canada (McPhail and Lindsey 1970). Of the Pacific salmon, chinook salmon exhibit arguably the most diverse and complex life history strategies. Healey (1986) described 16 age categories for chinook salmon, seven total ages with three possible freshwater ages. This level of complexity is roughly comparable to that seen in sockeye salmon (*O. nerka*), although the latter species has a more extended freshwater residence period and uses different freshwater habitats (Miller and Brannon 1982, Burgner 1991). Two generalized freshwater life-history types were initially described by Gilbert (1912): "stream-type" chinook salmon, which reside in fresh water for a year or more following emergence, and "ocean-type" chinook salmon, which migrate to the ocean within their first year. Healey (1983, 1991) has promoted the use of broader definitions for "ocean-type" and "stream-type" to describe two distinct races of chinook salmon. Healey's approach incorporates life history traits, geographic distribution, and genetic differentiation and provides a valuable frame of reference for comparisons of chinook salmon populations.

UCR Chinook

The UCR spring-run chinook salmon ESU inhabits tributaries upstream from the Yakima River to Chief Joseph Dam. UCR spring-run chinook salmon have a stream-type life history. Three independent populations of spring-run chinook salmon are identified for the ESU including those that spawn in the Wenatchee, Entiat, and Methow River Basins (Ford *et al.* 1999). Adults return to the Wenatchee River from late March through early May, and to the Entiat and Methow Rivers from late March through June. Most adults return after spending two years in the ocean, although 20 percent to 40 percent return after three years at sea. Like Snake River spring/summer chinook salmon, UCR spring-run chinook salmon experience very little ocean harvest. Peak spawning for all three populations occurs from August to September. Smolts typically spend one year in freshwater before migrating downstream. There are slight genetic differences between this ESU and others containing stream-type fish, but more importantly, the ESU boundary was defined using ecological differences in spawning and rearing habitat (Myers *et al.* 1998). The Grand Coulee Fish Management Program (1939 through 1943) may have had a major influence on this ESU because fish from multiple populations were mixed into one relatively homogenous group and redistributed into streams throughout the upper Columbia River region.

Steelhead

Steelhead can be divided into two basic run types based on their level of sexual maturity at the time they enter fresh water and the duration of the spawning migration (Burgner et al. 1992). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in fresh water to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns relatively shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Some river basins have both summer and winter steelhead, others only have one run type. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death. However, it is rare for steelhead to spawn more than twice before dying, and most that do so are females (Nickelson *et al.* 1992). Iteroparity is more common among southern steelhead populations than northern populations (Busby *et al.* 1996). Multiple spawnings for steelhead range from three percent to 20 percent of runs in Oregon coastal streams. Steelhead spawn in cool, clear streams with suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986, Everest 1973).

UCR Steelhead

UCR steelhead inhabit the Columbia River reach and its tributaries upstream of the Yakima River. This region includes several rivers that drain the east slopes of the Cascade Mountains and several that originate in Canada (only U.S. populations are included in the ESU). Dry habitat conditions in this area are less conducive to steelhead survival than in many other parts of the Columbia River Basin (Mullan *et al.* 1992a). Although the life history of this ESU is similar to that of other inland steelhead, smolt ages are some of the oldest on the West Coast (up to seven years old), probably due to the ubiquitous cold water temperatures (Mullan *et al.* 1992b). Adults spawn later than in most downstream populations, remaining in freshwater up to a year before spawning. Most current natural production occurs in the Wenatchee and Methow River systems, with a smaller run returning to the Entiat River (WDF *et al.* 1993). Very limited spawning also occurs in the Okanagan River Basin. Most of the fish spawning in natural production areas are of hatchery origin.

Overview—Status of the Species in the Action Area

To determine a species' status under extant conditions (usually termed "the environmental baseline"), it is necessary to ascertain the degree to which the species' biological requirements are being met at that time and in that action area. For the purposes of this consultation, UCR spring chinook and steelhead biological requirements are expressed in two ways: Population parameters such as fish numbers, distribution, and trends throughout the action area; and the condition of various essential habitat features such as water quality, stream substrates, and food

availability. Clearly, these two types of information are interrelated. That is, the condition of a given habitat has a large impact on the number of fish it can support. Nonetheless, it is useful to separate the species' biological requirements into these parameters because doing so provides a more complete picture of all the factors affecting UCR spring chinook steelhead survival. Therefore, the discussion to follow will be divided into two parts: Species Distribution and Trends; and Factors Affecting the Environmental Baseline.

Species Distribution and Trends

UCR Chinook

Information on the status and distribution of UCR spring chinook salmon is found in the status review prepared by NWFSC, NMFS (Myers *et al*. 1998). More recent information on the status and distribution of the chinook salmon ESU, including hatchery components of the respective populations, is provided in the status review update prepared by the West Coast Chinook Salmon Biological Review Team (NMFS1998c), the Evaluation of the Status of Chinook and Chum Salmon and Steelhead Hatchery Populations for ESUs Identified in Final Listing Determinations prepared by the Conservation Biology Division of the NWFSC (NMFS1999a), and in the Preliminary Conclusions Regarding the Updated Status of listed ESUs of West Coast Salmon and Steelhead (NMFS 2003). The discussions in these documents are summarized here.

There are no estimates of historical abundance specific to this ESU prior to the 1930s. The drainages supporting this ESU are all above Rock Island Dam on the upper Columbia River. Rock Island Dam is the oldest major hydroelectric project on the Columbia River; it began operations in 1933. Counts of returning chinook have been made since the 1930s. Annual estimates of the aggregate return of spring chinook to the upper Columbia are derived from the dam counts based on the nadir between spring and summer return peaks. Spring chinook salmon currently spawn in three major drainages above Rock Island Dam--Wenatchee, Methow and Entiat Rivers. Historically, spring chinook may have also used portions of the Okanogan River.

The 1998 Chinook Status Review (Myers et al. 1998) reported that long-term trends in abundance for upper Columbia spring chinook populations were generally negative, ranging from -5% to +1%. Analyses of the data series, updated to include 1996-2001 returns, indicate that those trends have continued. The long-term trend in spawning escapement is downward for all three systems. The Wenatchee River spawning escapements have declined an average of 5.6% per year, the Entiat River population at an average of 4.8%, and the Methow River population an average rate of 6.3% per year since 1958 (NMFS 2003).

In the 1960s and 1970s, spawning escapement estimates were relatively high with substantial year-to-year variability. Escapements declined in the early 1980s, then peaked at relatively high levels in the mid 1980s. Returns declined sharply in the late 1980s and early 1990s. Returns

between 1990-94 were at the lowest levels observed in the 40-plus years of the data sets. The Upper Columbia Biological Requirements Workgroup (Ford et al. 2001) recommended interim delisting levels of 3,750, 500, and 2,200 spawners for the populations returning to the Wenatchee, Entiat, and Methow drainages, respectively. The most recent 5-year geometric mean spawning escapements (1997-2001) were at 8%-15% of these levels. Target levels have not been exceeded since 1985 for the Methow run and the early 1970s for the Wenatchee and Entiat populations (NMFS 2003).

Short-term rates for the aggregate population areas reported in the 1998 Status Review (Myers et al. 1998) ranged from a -15.3% (Methow R.) to a -37.4% (Wenatchee R.). The Escapements from 1996-1999 reflected that downward trend. However, escapements increased substantially in 2000 and 2001 in all three systems. Returns to the Methow River and the Wenatchee River reflected the higher return rate on natural production as well as a large increase in contributions from supplementation programs. Short-term trends (1990-2001) in natural returns remain negative for all three upper Columbia spring chinook populations. Natural returns to the spawning grounds for the Entiat, Methow, and Wenatchee River populations continued downward at average rates of 3%, 10%, and 16% respectively (NMFS 2003).

McClure et al. (in press) reported standardized quantitative risk assessment results for 152 listed salmon stocks in the Columbia basin, including representative data sets (1980-2000 return years) for upper Columbia spring chinook. Average annual growth rate (λ) for the upper spring chinook population was estimated as 0.85, the lowest average reported for any of the Columbia River ESUs analyzed in the study. Assuming that population growth rates were to continue at the 1980-2000 levels, upper Columbia spring chinook populations are projected to have a very high probability of a 90% decline within 50 years (0.87 for the Methow River population, 1.0 for the Wenatchee and Entiat runs) (NMFS 2003).

UCR Steelhead

Information on the status and distribution of UCR steelhead is found in the status review prepared by the NWFSC, NMFS (Busby *et al*. 1996). More recent information on the status and distribution of the steelhead ESU is provided in the status review update prepared by the West Coast Steelhead Biological Review Team (NMFS1997), the Evaluation of the Status of Chinook and Chum Salmon and Steelhead Hatchery Populations for ESUs Identified in Final Listing Determinations prepared by the Conservation Biology Division of the NWFSC, NMFS (NMFS1999a), and in the Preliminary Conclusions Regarding the Updated Status of listed ESUs of West Coast Salmon and Steelhead (NMFS 2003). The discussions in these documents are summarized here.

Despite numerous efforts to halt and reverse declining trends in west coast steelhead, it is clear that the status of many native, naturally-producing populations has continued to deteriorate.

Estimates of historical (pre-1960s) abundance specific to the UCR steelhead ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size in excess of 5,000 adults for tributaries above Rock Island Dam (Chapman *et al.* 1994). Runs may have already been depressed by lower Columbia River fisheries at this time. Steelhead in the upper Columbia River ESU continue to exhibit low abundances, both in absolute numbers and in relation to numbers of hatchery fish throughout the region. Data from this ESU include separate total and natural run sizes, allowing the separation of hatchery and natural fish abundance estimates for at least some areas in some years.

A review of recent data indicates that natural steelhead abundance has declined or remained low in the major river basins in this ESU (Wenatchee, Methow, Okanogan) since the early 1990s. Returns of both hatchery and naturally produced steelhead to the upper Columbia have increased in recent years. Priest Rapids Dam is below upper Columbia steelhead production areas. The average 1997-2001 return counted through the Priest Rapids fish ladder was approximately 12,900 steelhead. The average for the previous five years (1992-1996) was 7,800 fish.

Total returns to the upper Columbia continue to be predominately hatchery-origin fish. The percentage of the run over Priest Rapids of natural origin increased to over 25% in the 1980s, then dropped to less than 10% by the mid-1990s. The median percent wild for 1997-2001 was 17% (NMFS 2003).

The estimate of the combined natural steelhead return to the Wenatchee and Entiat Rivers increased to a geometric mean of approximately 900 for the 1996-2001 period. The average percentage natural dropped from 35% to 29% for the recent 5-year period. Recent natural production levels remain well below the interim recovery levels developed for these populations (NMFS 2003).

Estimates of natural production in this steelhead ESU are well below replacement—indicating that natural steelhead populations in the upper Columbia River Basin are not self-sustaining at the present time. The Biological Review Team discussed anecdotal evidence that resident rainbow trout, which are in numerous streams throughout the region, contribute to anadromous run abundance. This phenomenon would reduce estimates of the natural steelhead replacement ratio.

Summary

Thus, the degree to which UCR steelhead and spring chinook biological requirements are being met in the action area with respect to population numbers and distribution is something of a mixed bag. While some improvement can be seen in recent years, both ESUs are still at critically low levels compared to both historic production and the desired escapement levels—particularly for natural fish. Therefore, while there is some cause for very guarded

optimism, there has been no genuine change in the species' status since they were listed as endangered, and the most likely scenario is that their biological requirements are not being met with respect to abundance, distribution, or overall trend.

Factors Affecting the Environmental Baseline in the Action Area

Environmental baselines for biological opinions are defined by regulation at 50 CFR 402.02, which states that an environmental baseline is the physical result of all past and present state, Federal, and private activities in the action area along with the anticipated impacts of all proposed Federal projects in the action area (that have already undergone formal or early section 7 consultation). The environmental baseline for *this* biological opinion is therefore the result of the impacts a great many activities (summarized below) have had on UCR steelhead and spring chinook survival and recovery. Put another way (and as touched upon previously), the baseline is the culmination of the effects that multiple activities have had on the species' *biological requirements* and, by examining those individual effects, it is possible to derive the species' status in the action area.

Many of the biological requirements for UCR steelhead and spring chinook in the action area can best be expressed in terms of essential habitat features. That is, the fish require adequate: (1) substrate (especially spawning gravel), (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) migration conditions (65 FR 7764). The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features. These factors are well known and documented in dozens—if not hundreds—of scientific papers, policy documents, news articles, books, and other media. It is therefore unnecessary to detail in this opinion the many ways in which human activities and natural factors have affected the UCR steelhead's and chinook's habitat-related biological requirements; thus the following paragraphs constitute a brief summary of what the most recent accepted science has to say about how human action and natural processes have degraded essential steelhead habitat features in the UCR subbasin.

Some factors in the action area (e.g., hydropower and agricultural development—particularly irrigation diversions) have had adverse effects on every single one of the habitat-related biological requirements listed above, while other factors have only affected some of those essential habitat features. For example, road building in the UCR subbasin has had a sizeable effect on stream substrates and water quality (through siltation), and road culverts have blocked fish passage, but such activities have not had much of an effect on water velocity. In another instance, timber harvest and grazing activities have affected—to greater or lesser degrees—all the factors except space. And urban development has affected them all, but generally to a small degree in the largely rural UCR subbasin. In short, nearly every widespread human activity in the basin has adversely affected some or all of habitat features listed above. And by disrupting

those habitat features, these activities—coupled with hatchery and fishery effects and occasional natural disturbances such as drought and fire—have had detrimental impacts on UCR steelhead and spring chinook health, physiology, numbers, and distribution in every subpopulation and at every life stage. For detailed information on how various factors have degraded essential habitat features in the UCR subbasin, please see any of the following: NMFS (1991), NMFS (1997), NMFS (1998a), NMFS (2000a), NMFS (2002a), NMFS (2003a) and, in particular, NMFS (2000c).

Summary

In conclusion, the picture of whether UCR steelhead and spring chinook biological requirements are being met is more clear-cut for habitat-related parameters than it is for population factors: given all the factors for decline, it is clear that the UCR steelhead's and spring chinook's biological requirements are currently not being met under the environmental baseline. Thus their status is such that there must be a significant improvement in the environmental conditions of their habitat (over those currently available under the environmental baseline). Any further degradation of the environmental conditions could have a large impact because the species is already at risk of going extinct. In addition, there must be efforts to minimize impacts caused by dams, harvest, hatchery operations, habitat degradation, and unfavorable natural conditions.

EFFECTS OF THE PROPOSED ACTIONS

Evaluating the Effects of the Action

Over the course of the last decade and hundreds of ESA section 7 consultations, NMFS developed the following four-step approach for applying the ESA Section 7(a)(2) standards when determining what effect a proposed action is likely to have on a given listed species. What follows here is a summary of that approach.

1. Define the biological requirements and current status of each listed species.

2. Evaluate the relevance of the environmental baseline to the species' current status.

3. Determine the effects of the proposed or continuing action on listed species and their habitat.

4. Determine whether the species can be expected to survive with an adequate potential for recovery under (a) the effects of the proposed (or continuing) action, (b) the effects of the environmental baseline, and (c) any cumulative effects—including all measures being taken to improve salmonid survival and recovery.

The fourth step above requires a two-part analysis. The first part focuses on the action area and defines the proposed action's effects in terms of the species' biological requirements in that area (i.e., impacts on essential habitat features). The second part focuses on the species itself. It describes the action's impact on individual fish—or populations, or both—and places that impact in the context of the ESU as a whole. Ultimately, the analysis seeks to answer the questions of whether the proposed action is likely to jeopardize a listed species' continued existence or destroy or adversely modify its critical habitat (if any exists).

Description of Effects on Habitat

Previous sections have discussed the scope of the UCR steelhead and spring chinook habitat in the action area, described the essential features of that habitat, and depicted its present condition. The discussion here focuses on how those features are likely to be affected by the proposed actions.

Full descriptions of the proposed activities are found in the next section. In general, the activities will be (a) electrofishing—using both backpack- and boat-based equipment, (b) snorkel surveys in spawning and rearing habitat, (c) capturing fish with angling equipment, traps, and nets of various types, and (d) marking the captured fish with various types of tags. All of these techniques are minimally intrusive in terms of their effect on habitat. None of them will

measurably affect any of the 10 essential fish habitat features listed earlier (i.e., stream substrates, water quality, water quantity, food, streamside vegetation, etc.). Moreover, the proposed activities are all of short duration. Therefore, NMFS concludes that the proposed activities are not likely to have an adverse impact on UCR steelhead and spring chinook habitat, and thus will not jeopardize the fish by reducing the ability of that habitat to contribute to their survival and recovery.

Effects on UCR Steelhead and Spring Chinook

The primary effects the proposed activities will have on listed UCR fish will occur in the form of direct "take" (the ESA take definition is given in the section introducing the individual permits), a major portion of which comes in the form of harassment. Harassment generally leads to stress and other sub-lethal effects and is caused by observing, capturing, and handling fish. The ESA does not define harassment nor has NMFS defined this term through regulation. However, the USFWS defines harassment as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to breeding, feeding or sheltering" [50 CFR 17.3]. For the purposes of this analysis, NMFS adopts this definition of harassment.

The various proposed activities would cause many types of take, and while there is some blurring of the lines between what constitutes an activity (e.g., electrofishing) and what constitutes a take category (e.g., harm), it is important to keep the two concepts separate. The reason for is this is that the effects being measured here are those which the activity itself has on the listed species. They may be expressed in *terms* of the take categories (e.g., how many UCR spring chinook and steelhead are harmed, or harassed, or even killed), but the actual mechanisms of the effects themselves (i.e., the activities) are the causes of whatever take arises and, as such, they bear examination. Therefore, the first part of this section is devoted to a discussion of the general effects known to be caused by the proposed activities—regardless of where they occur or what species are involved.

The following subsections describe the types of activities being proposed. Because they would all be carried out by trained professionals using established protocols and have widely recognized specific impacts, each activity is described in terms broad enough to apply to every proposed permit. This is especially true in light of the fact that the researchers would not receive a permit unless their activities (e.g., electrofishing) incorporate NMFS' uniform, pre-established set of mitigation measures.

Observation

For some studies, listed fish will be observed in-water (i.e., snorkel surveys). Direct observation is the least disruptive method for determining presence/absence of the species and estimating

their relative abundance. Its effects are also generally the shortest-lived among any of the research activities discussed in this section. Typically, a cautious observer can effectively obtain data without disrupting the normal behavior of a fish. Fry and juveniles frightened by the turbulence and sound created by observers are likely to seek temporary refuge in deeper water or behind or under rocks or vegetation. In extreme cases, some individuals may temporarily leave a particular pool or habitat type when observers are in their area. Researchers minimize the amount of disturbance by moving through streams slowly—thus allowing ample time for fish to reach escape cover; though it should be noted that the research may at times involve observing adult fish—which are more sensitive to disturbance. During some of the research activities discussed below, redds may be visually inspected, but no redds will be walked on. Harassment is the primary form of take associated with these observation activities, and few if any injuries or deaths are expected to occur—particularly in cases where the observation is to be conducted solely by researchers on the stream banks rather than in the water. There is little a researcher can do to mitigate the effects associated with observation activities because those effects are so minimal. In general, all they can do is move with care and attempt to avoid disturbing sediments, gravels, and, to the extent possible, the fish themselves.

Capture/handling

Capturing and handling fish causes them stress—though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived. The primary contributing factors to stress and death from handling are excessive doses of anesthetic, differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps if the traps are not emptied on a regular basis. Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis.

Based on prior experience with the research techniques and protocols that would be used to conduct the proposed scientific research, no more than five percent of the juvenile salmonids encountered are likely to be killed as an indirect result of being captured and handled and, in most cases, that figure will not exceed three percent. In addition, it is not expected that more than one percent of the adults being handled will die. In any case, all researchers will adhere to the terms and conditions described earlier (page 4) and thereby keep adverse effects to a minimum. Finally, any fish unintentionally killed by the research activities in the proposed permits may be retained as reference specimens or used for analytical purposes.

Electrofishing

Electrofishing is a process by which an electrical current is passed through water containing fish in order to stun them—thus making them easier to capture. It can cause a suite of effects ranging form simple harassment to actually killing the fish (adults and juveniles) in an area where it is occurring. The amount of unintentional mortality attributable to electrofishing may vary widely depending on the equipment used, the settings on the equipment, and the expertise of the technician. Electrofishing can have severe effects on adult salmonids. Spinal injuries in adult salmonids from forced muscle contraction have been documented. Sharber and Carothers (1988) reported that electrofishing killed 50 percent of the adult rainbow trout in their study. The long-term effects electrofishing has on both juvenile and adult salmonids are not well understood, but long experience with electrofishing indicates that most impacts occur at the time of sampling and are of relatively short duration.

The effects electrofishing may have on UCR spring chinook and steelhead would be limited to the direct and indirect effects of exposure to an electric field, capture by netting, holding captured fish in aerated tanks, and the effects of handling associated with transferring the fish back to the river (see the next subsection for more detail on capturing and handling effects). Most of the studies on the effects of electrofishing on fish have been conducted on adult fish greater than 300 mm in length (Dalbey et al. 1996). The relatively few studies that have been conducted on juvenile salmonids indicate that spinal injury rates are substantially lower than they are for large fish. Smaller fish intercept a smaller head-to-tail potential than larger fish (Sharber and Carothers 1988) and may therefore be subject to lower injury rates (e.g., Hollender and Carline 1994, Dalbey et al. 1996, Thompson et al. 1997). McMichael et al. (1998) found a 5.1% injury rate for juvenile MCR steelhead captured by electrofishing in the Yakima River subbasin. The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers 1988, McMichael 1993, Dalbey et al. 1996, Dwyer and White 1997). Continuous direct current (DC) or low-frequency ($\leq$30 Hz) pulsed DC have been recommended for electrofishing (Fredenberg 1992, Snyder 1992 and 1995, Dalbey et al. 1996) because lower spinal injury rates, particularly in salmonids, occur with these waveforms (Fredenberg 1992, McMichael 1993, Sharber et al. 1994, Dalbey et al. 1996). Only a few recent studies have examined the long-term effects of electrofishing on salmonid survival and growth (Ainslie et al. 1998, Dalbey et al. 1996). These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes they show no growth at all (Dalbey et al. 1996).

NMFS' electrofishing guidelines (NMFS 2000b) will be followed in all surveys employing electrofishing equipment. The guidelines require that field crews be trained in observing animals for signs of stress and shown how to adjust electrofishing equipment to minimize that stress. Electrofishing is used only when other survey methods are not feasible. All areas for stream and special needs surveys are visually searched for fish before electrofishing may begin. Electrofishing is not done in the vicinity of redds or spawning adults. All electrofishing

equipment operators are trained by qualified personnel to be familiar with equipment handling, settings, maintenance, and safety. Operators work in pairs to increase both the number of fish that may be seen and the ability to identify individual fish without having to net them. Working in pairs also allows the researcher to net fish before they are subjected to higher electrical fields. Only DC units will be used, and the equipment will be regularly maintained to ensure proper operating condition. Voltage, pulse width, and rate will be kept at minimal levels and water conductivity will be tested at the start of every electrofishing session so those minimal levels can be determined. When such low settings are used, shocked fish normally revive instantaneously. Fish requiring revivification will receive immediate, adequate care.

The preceding discussion focused on the effects of using a backpack unit for electrofishing and the ways those effects will be mitigated. It should be noted, however, that in larger streams and rivers electrofishing units are sometimes mounted on boats or rafts. These units often use more current than backpack electrofishing equipment because they need to cover larger (and deeper) areas and, as a result, can have a greater impact on fish. In addition, the environmental conditions in larger, more turbid streams can limit researchers' ability to minimize impacts on fish. That is, in areas of lower visibility it can be difficult for researchers to detect the presence of adults and thereby take steps to avoid them. Because of its greater potential to harm fish, and because NMFS has not published appropriate guidelines, boat electrofishing has not been given a general authorization under NMFS' recent ESA section 4(d) rules. However, it is expected that guidelines for safe boat electrofishing will be in place in the near future. And in any case, all researchers intending to use boat electrofishing will use all means at their disposal to ensure that a minimum number of fish are harmed (these means will include a number of long-established protocols that will eventually be incorporated int NMFS' guidelines).

Tagging/marking

Techniques such as PIT-tagging (passive integrated transponder tagging), coded wire tagging, fin-clipping, and the use of radio transmitters are common to many scientific research efforts using listed species. All sampling, handling, and tagging procedures have an inherent potential to stress, injure, or even kill the marked fish. This section discusses each of the marking processes and its associated risks.

A PIT tag is an electronic device that relays signals to a radio receiver; it allows salmonids to be identified whenever they pass a location containing such a receiver (e.g., any of several dams) without researchers having to handle the fish again. The tag is inserted into the body cavity of the fish just in front of the pelvic girdle. The tagging procedure requires that the fish be captured and extensively handled, therefore any researchers engaged in such activities will follow the conditions listed in the Description of the Proposed Actions section (as well as any permit-specific terms and conditions) to ensure that the operations take place in the safest possible manner. In general, the tagging operations will take place where there is cold water of high

quality, a carefully controlled environment for administering anesthesia, sanitary conditions, quality control checking, and a carefully regulated holding environment where the fish can be allowed to recover from the operation.

PIT tags have very little effect on growth, mortality, or behavior. The few reported studies of PIT tags have shown no effect on growth or survival (Prentice et al. 1987; Jenkins and Smith 1990; Prentice et al. 1990). For example, in a study between the tailraces of Lower Granite and McNary Dams (225 km), Hockersmith et al. (2000) concluded that the performance of yearling chinook salmon was not adversely affected by gastrically- or surgically implanted sham radio tags or PIT-tags. Additional studies have shown that growth rates among PIT-tagged Snake River juvenile fall chinook salmon in 1992 (Rondorf and Miller 1994) were similar to growth rates for salmon that were not tagged (Conner et al. 2001). Prentice and Park (1984) also found that PIT-tagging did not substantially affect survival in juvenile salmonids.

Another other primary method for tagging fish is to implant them with radio tags. There are two main ways to accomplish this and they differ in both their characteristics and consequences. First, a tag can be inserted into a fish's stomach by pushing it past the esophagus with a plunger. Stomach insertion does not cause a wound and does not interfere with swimming. This technique is benign when salmon are in the portion of their spawning migrations during which they do not feed (Nielsen, 1992). In addition, for short-term studies, stomach tags allow faster post-tagging recovery and interfere less with normal behavior than do tags attached in other ways.

The second method for implanting radio tags is to place them within the body cavities of (usually juvenile) salmonids. These tags do not interfere with feeding or movement. However, the tagging procedure is difficult, requiring considerable experience and care (Nielson 1992). Because the tag is placed within the body cavity, it is possible to injure a fish's internal organs. Infections of the sutured incision and the body cavity itself are also possible, especially if the tag and incision are not treated with antibiotics (Chisholm and Hubert 1985, Mellas and Haynes 1985).

Fish with internal radio tags often die at higher rates than fish tagged by other means because radio tagging is a complicated and stressful process. Mortality is both acute (occurring during or soon after tagging) and delayed (occurring long after the fish have been released into the environment). Acute mortality is caused by trauma induced during capture, tagging, and release. It can be reduced by handling fish as gently as possible. Delayed mortality occurs if the tag or the tagging procedure harms the animal in direct or subtle ways. Tags may cause wounds that do not heal properly, may make swimming more difficult, or may make tagged animals more vulnerable to predation (Howe and Hoyt 1982, Matthews and Reavis 1990, Moring 1990). Tagging may also reduce fish growth by increasing the energetic costs of swimming and maintaining balance. As with the other forms of tagging and marking, researchers will keep the

harm caused by radio tagging to a minimum by following the conditions given on page 6 of this Opinion, as well as any other permit-specific requirements.

Fin clipping is the process of removing part or all of one or more fins to alter a fish's appearance and thus make it identifiable. When entire fins are removed, it is expected that they will never grow back. Alternatively, a permanent mark can be made when only a part of the fin is removed or the end of a fin or a few fin rays are clipped. Although researchers have used all fins for marking at one time or another, the current preference is to clip the adipose, pelvic, or pectoral fins. Marks can also be made by punching holes or cutting notches in fins, severing individual fin rays (Welch and Mills 1981), or removing single prominent fin rays (Kohlhorst 1979). Many studies have examined the effects of fin clips on fish growth, survival, and behavior. The results of these studies are somewhat variable; however, it can be said that fin clips do not generally alter fish growth. Studies comparing the growth of clipped and unclipped fish generally have shown no differences between them (e.g., Brynildson and Brynildson 1967). Moreover, wounds caused by fin clipping usually heal quickly—especially those caused by partial clips.

Mortality among fin-clipped fish is also variable. Some immediate mortality may occur during the marking process, especially if fish have been handled extensively for other purposes (e.g., stomach sampling). Delayed mortality depends, at least in part, on fish size; small fishes have often been found to be susceptible to it and Coble (1967) suggested that fish shorter than 90 mm are at particular risk. The degree of mortality among individual fishes also depends on which fin is clipped. Studies show that adipose- and pelvic-fin-clipped coho salmon fingerlings have a 100% recovery rate (Stolte 1973). Recovery rates are generally recognized as being higher for adipose- and pelvic-fin-clipped fish in comparison to those that are clipped on the pectoral, dorsal, and anal fins (Nicola and Cordone, 1973).Clipping the adipose and pelvic fins probably kills fewer fish because these fins are not as important as other fins for movement or balance (McNeil and Crossman 1979). Mortality is generally higher when the major median and pectoral fins are clipped. Mears and Hatch (1976) showed that clipping more than one fin may increase delayed mortality, but other studies have been less conclusive.

Regardless, any time researchers clip or remove fins, it is necessary that the fish be handled. Therefore, the same safe and sanitary conditions required for tagging operations also apply to clipping activities.

Sacrifice

In some instances, it is necessary to kill a captured fish in order to gather whatever data a study is designed to produce. In such cases, determining effect is a very straightforward process: the sacrificed fish, if juveniles, are forever removed from the ESU's gene pool; if the fish are adults, the effect depends upon whether they are killed before or after they have a chance to spawn. If they are killed after they spawn, there is very little overall effect. Essentially, it amounts to

removing the nutrients their bodies would have provided to the spawning grounds. If they are killed before they spawn, not only are they removed from the ESU, but so are all their potential progeny. Thus, killing pre-spawning adults has the greatest potential to affect their ESU and, because of this, NMFS rarely allows it to happen. And, in almost every instance where it is allowed, the adults are stripped of sperm and eggs so their progeny can be raised in a controlled environment such as a hatchery—thereby greatly decreasing the potential harm posed by sacrificing the adults. Clearly, there is no way to mitigate the effects of outrightly sacrificing a fish.

Permit-Specific Effects

Permit 1114

Permit 1114 would allow the WDFW to annually capture and handle juvenile endangered UCR chinook salmon (natural and artificially propagated) and adult and juvenile endangered UCR steelhead (natural and artificially propagated). The research would take place at Rock Island Dam in Washington State from April through August every year. The juvenile fish would be collected from the second powerhouse gatewells and the fishway attraction water intake. Once captured, they would be held for as long as 24 hours and anesthetized before sampling for information (i.e., fork length, species, presence/absence of coded wire tags (CWTs), adipose fin clips, PIT tags, and gas bubble trauma (GBT)). A subset of those captured would be also be PIT-tagged at that time. Then all captured fish would be allowed to recover and released downstream from the facility. A small number of UCR steelhead kelts that stray into the bypass system would also be captured, examined, and immediately released downstream.

The amount of take WDFW is requesting is found in the following table. It is important to note that in this and all other instances where unintentional mortalities are displayed, the number of dead fish is a part of the overall take request. Thus, for example, in the first two lines of the table below, the WDFW is asking to capture a total of 11,493 spring chinook juveniles (some 2,463 of which would be tagged); the 395 fish that may die as a result of that action come *out of* that total. They are not added to it.

Table 2. Requested Take by ESU, Life Stage, Origin, and Activity for Permit 1114 (C=Capture, H=Handle, T=Tag, R=Release)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality*
UCR Spr. Chinook	Juvenile	Natural	C/H/R	11,493	
UCR Spr. Chinook	Juvenile	Natural	C/H/T/R	2,463	395
UCR Spr. Chinook	Juvenile	Hatchery	C/H/R	9,128	
UCR Spr. Chinook	Juvenile	Hatchery	C/H/T/R	1,858	302
UCR Steelhead	Juvenile	Natural	C/H/R	10,755	
UCR Steelhead	Juvenile	Natural	C/H/T/R	1,200	205
UCR Steelhead	Juvenile	Hatchery	C/H/R	17,100	
UCR Steelhead	Juvenile	Hatchery	C/H/T/R	2,800	325
UCR Steelhead	Adult	Natural	C/H/R	18	1
UCR Steelhead	Adult	Hatchery	C/H/R	62	1

*The "Unintentional Mortality" total is for the entire operation—capturing, handling, and tagging. It was not possible to separate the mortality rates associated with tagging the fish from those associated with simply capturing, anesthetizing, and examining them.

Thus, the smolt monitoring and tagging operations at Rock Island Dam would kill a maximum total of 395 juvenile, natural UCR chinook, 302 juvenile, hatchery UCR chinook, 205 juvenile, natural steelhead, and 325 juvenile, hatchery steelhead. To determine the effect of these losses, it is necessary to compare them to the total outmigrant numbers expected for these species:

Table 3. Expected Outmigration for listed UCR Chinook and Steelhead (Ferguson 2003*).

ESU/Species	Origin	Outmigration
UCR Spr. Chinook	Natural	2,495,889
UCR Spr. Chinook	Hatchery	1,262,700
UCR Steelhead	Natural	670,161
UCR Steelhead	Hatchery	1,221,357

*It should be noted that since the Ferguson (2003) estimates, actual outmigration numbers have proven to be higher. Nonetheless, the above estimates will continue to be used in the interests of being as conservative as possible with respect to estimating the impacts of the proposed take in all permits.

By combining Tables 2 and 3, it is possible to determine what percentages of the outmigration would be taken, and what percentage would be killed under Permit 1114:

Table 4. Percentage of the 2003 Outmigration (Individualized for Natural and Hatchery Components) Likely to be Affected by Permit 1114.

ESU/Species	Origin	% of Outmigration Taken	% Mortalities
UCR Spr. Chinook	Natural	0.4%	0.02%
UCR Spr. Chinook	Hatchery	0.7%	0.02%
UCR Steelhead	Natural	1.6%	0.03%
UCR Steelhead	Hatchery	1.4%	0.03%

The WDFW would also be permitted to kill up to one natural and one hatchery adult steelhead, though it is unlikely that any would die at all. But even if they do, in either case the steelhead would be a spawned-out kelt and would likely already be in the process of dying. Nonetheless, to determine the magnitude of the potential loss, it must be placed in the context of the expected UCR steelhead adult returns. The following table displays the 1997-2001 geometric means for returning steelhead in the two main spawning areas of the upper Columbia.

Table 5. Recent Five-year geometric Means for Adult Steelhead returns in the Upper Columbia River (NMFS 2003).

	Natural	Hatchery
Entiat/Wenatchee System	894	2385
Methow/Okanogan System	358	4457
Totals	1252	6842

Because it is impossible to determine where in the ESU either the juveniles or adults would originate. The take levels for both must be placed in the context of the ESU as a whole. Therefore, the natural and hatchery adults that may die represent 0.08% and 0.01% of the ESU, respectively. And the juveniles that may, at a maximum, be killed during the Permit operations represent 0.02% of the runs for both natural and hatchery UCR chinook, and 0.03% for both natural and hatchery UCR steelhead. These losses are so small as to make it impossible to determine what negative effect they would have on the ESUs. This is particularly true for the adult steelhead because they would likely die on their own in any case.

Though the negative effects of the research are vanishingly small, the researchers will take the following steps to reduce them even further: (1) the fish will be transferred from the original holding tank to the sampling trailer in sanctuary nets and a small flume, (2) an ionic salt

solutions will be added to the handling tanks to reduce fish stress, (3) the anesthetic levels in the sampling trailer holding tanks will be carefully monitored, (4) the tagging equipment will be carefully sterilized, and (5) fish will be immediately transferred to a recovery raceway after sampling and will be monitored to be sure that they have recovered completely from the anesthetic before being released downstream. Given these measures, the already stated Permit Conditions (page 5), and the crucial nature of the research in terms of its utility in managing the upper Columbia River and determining the ongoing status of the species in that region, the small losses to be incurred are entirely discountable.

Permit 1119

Permit 1119 would allow the USFWS to annually capture, handle, tag, tissue sample, and rescue juvenile and adult UCR spring chinook and steelhead (natural and hatchery) during the course of five studies in the Entiat River and Peshastin Creek, Washington. (The rescue/salvage operations may take place in a number of other places as well.) The studies are: Study 1—Recovery of ESA-listed Entiat River Salmonids through Improved Management Actions; Study 2—From extirpation to colonization: an attempt to restore salmon back to their former streams; Study 3—Entiat Basin Spawning Ground Surveys; Study 4—Snorkel Surveys in the Wenatchee, Entiat, Methow, Okanogan, and Yakima Watersheds and Other Waterways of Eastern Washington; Study; 5—Fish Salvage Activities in the Wenatchee, Entiat, Methow, Okanogan, and Yakima Watersheds and other Waterways of Eastern Washington.

The effects of studies 2 and 3 are limited to harassment as the only form of take. Listed fish will not be captured or handled in any way during the course of these two studies (though tissue samples may be taken from dead fish under Study 2). Therefore, because the take would be limited in time and location, and because no listed fish would suffer any negative effects (aside from possibly having to relocate temporarily), the effects of the research in these instances are entirely discountable and will not be explored further.

Study 1

Under Study 1, the USFWS would use a screw trap in the Entiat River to capture juvenile UCR spring chinook and steelhead. The fish would anesthetized, measured to fork length, weighed, examined for identifying marks, and identified by age class. At that point, a small, non-lethal scale sample would be taken from all steelhead—after which, they would be allowed to recover and immediately returned to the river. Most spring chinook would simply be measured, examined and released. However, up to 100 of them would sampled for genetic analysis by clipping a 1mm X 1mm piece of tissue from a fin. This is not expected to cause any lasting harm whatsoever. Another subsample (a maximum of 200 a week—though some of those will be unlisted fall chinook) of the chinook juveniles would be marked with PAN-JET fin tatooing or

Bismark Brown dye, brought upstream, and released to determine trap efficiency. And a further subsample—1,000 spring chinook—will be PIT-tagged before release. The requested take amounts can be seen in Table 6, below.

Table 6. Requested Take by ESU, Life Stage, Origin, and Activity for Study 1 of Permit 1119. (C=Capture, H=Handle, T=Tag, M= mark R=Release, TS=tissue sample.)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality*
UCR Spr. Chinook	Juvenile	Natural	C/H/R	10,000	
UCR Spr. Chinook	Juvenile	Natural	C/H/T/M/R	5,000	100
UCR Spr. Chinook	Juvenile	Hatchery	C/H/R	5,000	
UCR Spr. Chinook	Juvenile	Hatchery	C/H/T/R	2,000	100
UCR Steelhead	Juvenile	Natural	C/H/TS/R	6,000	50
UCR Steelhead	Juvenile	Hatchery	C/H/TS/R	500	15

*The "Unintentional Mortality" total is for the entire operation—capturing, handling, and tagging and sampling (some of the fish). It was not possible to separate the mortality rates associated with tagging the fish from those associated with simply capturing, anesthetizing, and examining them.

All the fish would be captured from the Entiat River. While it is not known how many steelhead and Chinook smolts migrate down the Entiat (in fact this study will help with that), it is reasonable to assume that its some number less than the total for the ESU. It can be narrowed further by examining dam passage estimates. In this instance 849,301 natural and 710,993 hatchery chinook are expected to arrive at Wells Dam in 2003 (Ferguson 2003). And because 2,320,129 natural 925,905 hatchery chinook are expected to arrive at Rock Island Dam (Ferguson 2003), this means that 1,410,828 natural and 214,912 hatchery fish will arrive at the river between those two facilities. This covers the Entiat and Wenatchee Rivers and some smaller tributaries, and while it is not the Entiat specifically, it will help give a better picture of the local impact of the proposed take.

A similar exercise can be done for steelhead. The results of the two exercises are combined for display in the following table. It gives a picture of the number of listed fish outmigrating from the two main components of the UCR steelhead and chinook ESUs.

Table 7. Numbers of Spring Chinook and Steelhead Outmigrating from the Okanogan/Methow and Entiat/Wenatchee systems in the Upper Columbia River.

ESU/Species	Origin	Okanogan/Methow	Entiat/Wenatchee
UCR Spr. Chinook	Natural	849,301	1,470,828
UCR Spr. Chinook	Hatchery	710,993	214,912
UCR Steelhead	Natural	404,892	168,383
UCR Steelhead	Hatchery	544,144	327,891

By applying the requested take to the numbers in the table above, it is possible to get a clearer picture of what impacts Study 1 is likely to have:

Table 8. Percentage of the 2003 Entiat/Wenatchee Outmigration Likely to be Affected by Study 1.

ESU/Species	Origin	% of Entiat/Wentachee Taken	% Mortalities
UCR Spr. Chinook	Natural	1.0%	0.007%
UCR Spr. Chinook	Hatchery	3.2%	0.04%
UCR Steelhead	Natural	3.5%	0.02%
UCR Steelhead	Hatchery	0.2%	0.005%

The main concern here is with the number of fish being taken and released—e.g., 3.5% of the natural steelhead in the area is somewhat high. However, almost none of the fish being taken are expected to suffer any lasting harm, and those that *are* killed represent a very small fraction of the local populations. The numbers are small enough, in fact that it is impossible to determine what negative effect the losses might have on the Entiat/Wenatchee populations—let alone the ESU as a whole.

Though the negative effects of the research are vanishingly small, the researchers will take the following steps to reduce them even further: (1) Holding times will be kept to a minimum, (2) the debris load of the Entiat River will be monitored and the trap will not be operated during peak debris movement, (3) the trap will be check and all fish and all debris will be removed at least every 24 hours, (4) trap operations will be evaluated if daily mortality rates rise above 1%, and (5) trapping will be discontinued if mortality rates remain above 1% after evaluation and adjustment. Given these measures, the already stated Permit Conditions (page 5), and the need

for population and genetic information this study fulfills, the small losses to be incurred are

entirely discountable.

Study 2

Study 2 has the same proposed actions, timing, methods, design, mitigation measures, and overall purpose as Study 1. The difference is that Study 2 takes place in Peshastin Creek—a tributary of the Wenatchee River—and it will not take any listed chinook or hatchery steelhead. It will take 16,000 natural steelhead yearly, of which a maximum of 160 can be expected to die. Therefore, 10% of the Entiat/Wenatchee population complex will be taken, and 0.01% may die as an unintentional result. As with Study 1, the actual take is fairly extensive. But again, very few of the fish will experience any lasting harm, the research fulfills a need, and it cannot be determined that the small amount of loss will have any overall negative impact on the Enitat/Wenatchee returns or on the ESU as a whole.

Study 5

Under Study 5, the USFWS would annually rescue stranded fish from various waterways in eastern Washington. The fish would be collected by net or by using electrofishing equipment set on the lowest possible level. Once captured, the fish would either be transferred immediately to a safe area or, if none is available, they would be held in a truck-mounted aerated tank with an ionic salt compound (to reduce stress), driven to the nearest safe area, allowed to acclimate, and released.

The captured fish would all be naturally produced. The USFWS may capture as many as 1000 juvenile and 50 adult steelhead and another 1000 juvenile and 50 adult spring chinook. Most would be saved from dying. It is possible that 10 juvenile and one adult of each species would unintentionally be killed during the capture and transfer process. But in any case, the mortality percentages are on the order of hundredths or thousandths of a percent, they represent fish that, by definition, would have died anyway, and their loss is clearly outweighed by the benefit associated with rescuing the other 2000-plus fish.

Permit 1156

Permit 1156 would allow the Dynamac Corporation (acting as an agent of the EPA) to annually capture, handle, and release juvenile and adult UCR spring chinook and steelhead (both natural and artificially propagated) during the course of research designed to gather water quality information and help enforce Clean Water Act standards. The research would take place in a number of subbasins in the upper Columbia River: the White River, the Wenatchee River, the Little Wenatchee River, the Chiwiwa River, the Methow River, and in Beaver, Mission, and

nason Creeks. The fish would be captured using backpack-and raft mount electrofishing equipment. The juveniles would be measured and examined, allowed to recover, and returned immediately to the river. If any adult fish are shocked, the electrofishing equipment would be turned off, and the would be allowed to swim away. It should be noted that for the purposes of delineating take, electrofishing is considered "handling" because it has a larger effect than simply observing/harassing the fish. Nonetheless, in this instance, none of the adult fish would actually be handled by humans. The researchers are requesting the following levels of take:

Table 9. Requested Take by ESU, Life Stage, Origin, and Activity for Permit 1119. (C=Capture, H=Handle, R=Release.)

ESU/Species	Life Stage	Origin*	Take Activity	Requested Take	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Natural	C/H/R	35	1
UCR Spr. Chinook	Juvenile	Hatchery	C/H/R	35	1
UCR Spr. Chinook	Adult	Both	C/H/R	8	0
UCR Steelhead	Juvenile	Hatchery	C/H/R	42	1
UCR Steelhead	Juvenile	Natural	C/H/R	42	1
UCR Steelhead	Adult	Both	C/H/R	10	0

*The origin of the adults is difficult to predict beforehand in this instance because the capture sites will be chosen semi-randomly from year to year. Therefore, they are grouped together. However, because the take levels are so small, it would not be far wrong to assume that approximately five of each origin type and ESU would be taken.

To determine the effect this research would have it is necessary to place the take numbers in the contexts of expected juvenile outmigration and adult returns (Tables 3 and 5). It is necessary to use the entire outmigration and adult return numbers (rather than a more geographically limited set) because the research will take place more-or-less uniformly throughout the range of the ESU.

Table 10. Percentage of the 2003 Outmigration (Individualized for Natural and Hatchery Components) and Adult Returns Likely to be Affected by Permit 1156.

ESU/Species	Life Stage	Origin	% of Outmigration Taken	% Mortalities
UCR Spr. Chinook	Juvenile	Natural	0.001%	0.00004%
UCR Spr. Chinook	Juvenile	Hatchery	0.002%	0.00007%
UCR Spr. Chinook	Adult			0%
UCR Steelhead	Juvenile	Natural	0.006%	0.0001%
UCR Steelhead	Juvenile	Hatchery	0.003%	0.00008%
UCR Steelhead	Adult		0.12%	0

The effect of these losses is as close to zero as it is possible to get. There is simply no way to discern what negative effect the handling or the mortality would have on a local level, let alone on the ESU level.

Though the negative effects of the research are almost zero, the researchers will take the following steps to reduce them even further: (1) consulting with local district biologists to minimize the possibility of even encountering listed fish, (2) training the electrofishing crews for two weeks, (3), using a very low pulse rate on the equipment to minimize harm to adult fish, (4) keeping holding and handling time to a minimum, and (5) not using chemicals to sedate fish. Given these measures, the already stated Permit Conditions (page 5), and the need for Clean Water Act enforcement and baseline water quality information this study fulfills, the small losses to be incurred are entirely discountable.

Permit 1194

Permit 1194 would allow the NWFSC to annually capture, PIT-tag, and release up to 10 adult, artificially propagated UCR spring chinook and up to 14 adult, artificially propagated UCR steelhead. A maximum of one adult, artificially propagated UCR spring chinook and one adult, artificially propagated UCR steelhead may be killed as an unintentional result of the research, though none are actually expected to die. The fish will be captured at Bonneville Dam. For the most part, the researchers will tag fish that have already been anesthetized as part of other research projects. The fish will be injected with a PIT-tag and will have a dorsal Peterson disk tag attached to them so they may easily be recognized (and the PIT-tag detection equipment tested). They will then be taken below the fish ladder and allowed to pass up it on their own.

The impact of this amount of take must be measured in terms of the effect on the ESU as a whole because there is no way to determine from what portion of the ESU the fish originate. Therefore the researchers are planning to handle 0.2% of the artificially propagated steelhead expected to

return to the upper Columbia River and may kill (though it is not likely) 0.01% of the run (see Table 5 for steelhead return numbers).

Using the fact that the 1997-2001 5-year geometric mean for returning UCR hatchery spring chinook is 645 (Tom Cooney, pers. comm.), this means that the researchers will also handle 1.5% of the spring chinook expected to return and may kill (though probably not) 0.2% of that run.

However, it is important to note that all these percentages numbers are probably smaller in actuality. There are two reasons for this. First, the 6,482 hatchery steelhead and 645 hatchery chinook expected to return already take into account upstream mortalities. So the numbers of returning fish to be found at Bonneville Dam are undoubtedly larger—and therefore the fraction to be affected is undoubtedly smaller. Second, the numbers are derived from recent 5-year geometric means, and in the most recent years the returns have skyrocketed, with as many as 12,000-15,000 hatchery fish returning to the upper Columbia River (NMFS 2003).

It is also necessary to consider that these impacts are only analyzed for the hatchery component of the ESU. If the natural returns are added in—1252 natural steelhead and 616 natural spring chinook—the percentages drop even further (by half in the case of spring chinook).

Thus, the negative effect that would be generated by the research is very small—especially given the fact that most of the fish will already have been captured and anesthetized for other research and there is a low probability that any will die at all. This, taken with the fact that the already low percentages are, for a number of reasons, probably much lower and that the proper operation of the PIT-tag detector at Bonneville is critical to determining many important facts about adult salmonid behavior and survival means that whatever lasting negative impact the research has would be negligible.

Permit 1290—Modification 1

Permit 1290 would allow the NWFSC to increase the number of juvenile UCR spring chinook and steelhead they annually capture during research activities in the Columbia River Estuary. The fish would be captured using purse seines, killed, and sampled for pathogens. (Though some fish—steelhead in particular—would be released unharmed.)

The amount of increased take being requested is four natural UCR spring chinook—all to be killed—and 13 natural UCR steelhead, none of which would be killed. This means that the research would kill 0.0002% of the UCR spring chinook outmigration and handle (but not harm) 0.002% of the steelhead outmigration. The adverse effects of these take levels are negligible—particularly in light of the fact that the research will yield critical information on the

presence of pathogens for all listed species in the Columbia River Estuary, and early knowledge of such pathogens may be very helpful in preventing harm to listed fish in the future.

Permit 1291—Modification 2

Permit 1291 would allow the USGS to annually capture, handle, and tag juvenile UCR spring chinook and steelhead of both hatchery and natural origin. Fish will be collected out of the juvenile bypass systems at the John Day Dam and diverted into a monitoring facility. Smolt Monitoring Program (SMP) personnel will anesthetize them and transfer them to a sorting trough. At the trough, SMP and USGS personnel will identify fish by species and rearing type (clipped or unclipped), enumerate them, and move them to a holding tank for recovery. Some fish will be set aside as research fish to be radio-tagged. All remaining fish will be held in a recovery tank following standard SMP procedures. Once recovered, all fish will be released back into the river through the juvenile bypass system. As stated above, the preferred site for collection of all target species is John Day Dam. However, as in years past, it may be difficult to

obtain all the needed fish from the daily SMP sample, therefore additional fish may need to be collected at McNary and/or Bonneville dams.

The fish to be tagged would be anesthetized in a 20 L bucket using a buffered solution of 70 mg/L MS-222 with an artificial slime restorer solution. In general, the daily SMP sample is sorted and fish are set aside for the pre-tag holding period of 12-48 hours before the transmitters are implanted. This holding period allows time for gut evacuation, which allows the fish to better tolerate the implantation procedures. The radio tags would be surgically or gastrically implanted—depending on conditions. The determination of which implantation procedure will be used is based on a variety of factors. If study fish are to be evaluated for a short period and the numbers of fish to be tagged are high, gastric implantation would be used. If the fish will be monitored for longer periods and/or the number of fish to be released is smaller, the transmitters may be implanted surgically. Fish condition and water temperature would also play a role in the decision.

In either case, the fish would be treated with great care under sterile conditions. After implantation the fish would be placed into a 20 L bucket containing oxygenated water for recovery. When fish recover equilibrium (<5 min) they are transferred via the 20 L bucket to a 125 L holding container. These containers are perforated to allow for water circulation and are held within a large metal tank along with other containers of fish. Approximately 24 hours after tagging is complete, each perforated container would be moved to a release site downstream from the dam. Fish condition would be monitored continuously during transport.

The requested levels of take are displayed in the following table.

Table 11. Requested Take by ESU, Life Stage, Origin, and Activity for Permit 1291 (C=Capture, H=Handle, T=Tag, R=Release)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take*	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Natural	C/H/R	6,273	94
UCR Spr. Chinook	Juvenile	Natural	C/H/T/R	483	29
UCR Spr. Chinook	Juvenile	Hatchery	C/H/R	1,491	22
UCR Spr. Chinook	Juvenile	Hatchery	C/H/T/R	115	7
UCR Steelhead	Juvenile	Natural	C/H/R	1,968	30
UCR Steelhead	Juvenile	Natural	C/H/T/R	315	19
UCR Steelhead	Juvenile	Hatchery	C/H/R	9,924	149
UCR Steelhead	Juvenile	Hatchery	C/H/T/R	1,168	70

*The C,H,R and C,H,T,R requests are separate. That is, in the first two rows, 6,273 will be captured, and released and another 483 will be captured for tagging.

Because it is impossible to determine the origin of these fish within the ESU, the context for the effect of the research is the entire outmigration.

Table 12. Percentage of the 2003 Outmigration (Individualized for Natural and Hatchery Components) Likely to be Affected by Permit 1291.

ESU/Species	Life Stage	Origin	% of Outmigration Taken*	% Mortalities*
UCR Spr. Chinook	Juvenile	Natural	0.3%	0.005%
UCR Spr. Chinook	Juvenile	Hatchery	0.1%	0.002%
UCR Steelhead	Juvenile	Natural	0.3%	0.007%
UCR Steelhead	Juvenile	Hatchery	0.9%	0.02%

*The number of fish taken and the mortalities are totals for the C,H,R, and C,H,T,R portions of the research.

Again, the context for effect here is the number of fish expected to die. This is because the fish that are merely captured are unlikely to suffer any lasting ill-effects. Moreover, most of those fish are being captured under another research program covering the activities of the SMP; thus, many of the mortalities ascribed here to Permit 1291 are actually analyzed under another permit. Nonetheless, they are grouped together here with the fish expected to die as a result of the tagging operation. In that way, it is certain that the mortality numbers are an overestimate

(probably more than double) of what effect this permit will add to an already established program. But even given that overestimate, the numbers are so small that it cannot be determined what overall negative effect the mortalities would have on the ESUs.

Though the negative effects are negligible, the USGS will work to reduce them even further. Much of what they intend by way of mitigation is described above. Nonetheless, it is worth noting that the USGS personnel will handle the fish only when necessary; complete the anesthetization and implantation as quickly and safely as possible (with fish condition as the highest priority); use an artificial slime restorer and a buffer when during the anesthetization process; administer antibiotics intra-peritoneally; and disinfect all surgical instruments; modify the implantation technique to the size and condition of the fish to minimize the stress associated with tagging; net fish only when necessary and only with sanctuary nets; and provide oxygen and high-flow water in to help the fish recover from the tagging procedures. Given these measures, the permit conditions listed on page 5, and the critical nature of the information being gathered with respect to fish behavior and survival, the negative effects of the research can be discounted.

Permit 1322—Modification 2

Modification 2 of Permit 1322 would authorize the NWFSC to increase the number of juvenile UCR spring chinook salmon they annually take in the Lower Columbia River estuary by lethally taking an additional 17 natural and 13 hatchery fish. The NWFSC proposes to beach seine near the Astoria Bridge and place trapnets in Cathlamet Bay. In addition to their current level of take, NWFSC proposes to capture (using beach seines and trap nets), anesthetize, scan for tags, measure, weigh, and sacrifice the fish for stomach content, scale, and otolith analyses.

This means that the researchers would kill an additional 0.0007% of the expected natural UCR spring chinook outmigration and 0.001% of the hatchery outmigration. It is impossible to determine what negative effect losses this small would have on the hatchery/natural components, let alone the ESU as a whole.

Even though the effect of the proposed take is infinitesimally small, the NWFSC proposes to use the following measures to minimize and mitigate that effect: All possible steps will be taken to remove fish from the seines and nets as quickly and gently as possible. Fish are immediately placed into estuarine water with aeration. To minimize the stress to all caught fish, the cod end of the beach seine and trapnet will never be completely out of the water. Dip nets with reservoir bags will be used to dip fish out of the seine to allow fish to remain in estuarine water when handled. If catches appear to be larger than anticipated, the duration and size of the hauls can be controlled to reduce catch volume (NWFSC 2001b). Given these actions, the small amount of increased take, and the beneficial uses to which the information would be put, the increased take is discountable.

Permit 1335—Modification 2

Modification 2 of Permit 1335 would allow the USFS to add 90 juvenile, artificially propagated UCR spring chinook and 300 juvenile, artificially propagated UCR steelhead to the species they are already allowed to capture, handle, and release under earlier versions of the permit. As many as two of the chinook and six of the steelhead may die as an unintentional result of the research. The fish would be captured using backpack electrofishing equipment, anesthetized, measured, allowed to recover, and immediately released.

Because the researchers will be operating in randomly chosen sites throughout the UCR, the context for determining effect is the entire outmigration of artificially propagated spring chinook and steelhead. Therefore, the researchers may take as much as an additional 0.007% of the UCR spring chinook hatchery out migration and kill as much as 0.0001% of it; they may also take as much as 0.02% of the hatchery steelhead and kill up to 0.0005%. This is so small a number as to have almost no effect at all. Even so, the researchers will try to get it as close to zero as possible. They will not do any electrofishing in areas with salmonid eggs or alevin, they will avoid all adult salmonids, and they will coordinate with state fish and game agencies whenever possible to avoid duplicate sampling. Given these measures, the small numbers of take, the mitigation measures listed on page 5, and the need to monitor Federal land use actions and their effects on aquatic habitats, the negative effects of the research may be entirely discounted.

Permit 1366—Modification 1

Permit 1366 would allow the OCFWRU and the ICFWRU to annually capture, tag, and release juvenile UCR spring chinook and steelhead (natural and artificially propagated) at Lower Granite, McNary, and Bonneville Dams. They will also do extensive radiotelemetry studies on the fish once they are tagged. Some of the steelhead juveniles would be sacrificed to obtain physiological information.

The OCFWRU is requesting the following levels of take:

Table 13. Requested Take by ESU, Life Stage, Origin, and Activity for Permit 1366. (C=Capture, H=Handle, T=Tag, R=Release, LT=Lethal Take)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Natural	C/H/R	920	26
UCR Spr. Chinook	Juvenile	Natural	LT	9	N/A
UCR Spr. Chinook	Juvenile	Hatchery	C/H/T/R	3	0
UCR Steelhead	Juvenile	Natural	C/H/R	185	8
UCR Steelhead	Juvenile	Hatchery	C/H/R	96	
UCR Steelhead	Juvenile	Hatchery	C/H/T/R	189	27*
UCR Steelhead	Juvenile	Hatchery	LT	9	N/A

*The Unintentional Mortality numbers are totals for of the C/H/R and C/H/T/R figures. That is, for the UCR hatchery steelhead to be captured, handled, and released (96), plus those that would be tagged as well (189), the total mortality is 27.

This signifies that the research will have the following impacts on listed UCR chinook and steelhead:

Table 14. Percentage of the 2003 Outmigration (Individualized for Natural and Hatchery Components) Likely to be Affected by Permit 1366.

ESU/Species	Life Stage	Origin	% of Outmigration Taken*	% Mortalities*
UCR Spr. Chinook	Juvenile	Natural	0.04%	0.001%
UCR Spr. Chinook	Juvenile	Hatchery	0.0001%	0%
UCR Steelhead	Juvenile	Natural	0.02%	0.001%
UCR Steelhead	Juvenile	Hatchery	0.02%	0.003%

*The number of fish taken and the mortalities are totals for the C,H,R, LT, and C,H,T,R portions of the research.

Because the researchers will be operating at dams on the mainstem Columbia and Snake Rivers, the context for determining effect is the entire outmigration of natural and artificially propagated spring chinook and steelhead. As the table above illustrates, the researchers will kill, at most, a few thousandths of a percent of the outmigration. This is so small a number as to have almost no effect at all. Even so, the researchers will try to get it as close to zero as possible: Any indirect

mortalities of listed juvenile fish will be used in place of direct mortalities. All non-targeted fish will be released after no more than 24 hours in the holding tanks. No additional handling will occur. Sampling procedures allow researchers to select only those fish suitable for the research. Fish are kept in water at all times. Non-target fish will be immediately removed from the samples before anesthetization and placed back in area from which they were removed. Targeted fish not sacrificed will be handled carefully and will be anesthetized before sampling and allowed to recover in a holding tank before release. Also, the researchers will coordinate with other agencies to avoid duplicative efforts whenever possible. Given all these efforts, the small number of fish that would be killed and the crucial nature of the information the research would generate with respect to fish survival and behavior and various modes of operating the hydropower complex and the transportation program, the negative effects can be considered negligible.

Permit 1379

Permit 1379 would allow CRITFC to annually capture, anesthetize, measure, (sometimes take tissue samples from), and release naturally and artificially propagated juvenile and adult UCR spring chinook and steelhead during the course of three different scientific studies in the Hanford Reach of the mid-Columbia River, at Bonneville Dam, and at Tumwater Dam on the Wenatchee River.

Study 1

Under Study 1, researchers would stick seines (or possibly some beach seines) to capture non-listed summer chinook in the Hanford Reach. They will also inadvertently catch some listed UCR stocks. The captured fish would be held for a time in livewells aboard the boats being used for the seining, and then in aerated tanks before being transferred to a tagging facility. At each juncture—initial capture, transfer to the holding tanks, and transfer to the tagging facility—every effort will be made to separate out listed stocks and release them back to the river as quickly as possible. CRITFC is requesting the following levels of take in Study 1:

Table 15. Requested Take by ESU, Life Stage, Origin, and Activity for Study 1. (C=Capture, H=Handle, R=Release.)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Natural	C/H/R	76	2
UCR Spr. Chinook	Juvenile	Hatchery	C/H/R	124	2
UCR Steelhead	Juvenile	Natural	C/H/R	30	1
UCR Steelhead	Juvenile	Hatchery	C/H/R	20	1

The effect of these losses must be placed in the context of the entire ESU because the fish would all be captured well below the point where the various populations come together in the river.

Table 15. Percentage of the 2003 Outmigration (Individualized for Natural and Hatchery Components) Likely to be Affected by Study 1.

ESU/Species	Life Stage	Origin	% of Outmigration Taken*	% Mortalities*
UCR Spr. Chinook	Juvenile	Natural	0.003%	0.00008%
UCR Spr. Chinook	Juvenile	Hatchery	0.01%	0.0002
UCR Steelhead	Juvenile	Natural	0.004%	0.0001%
UCR Steelhead	Juvenile	Hatchery	0.002%	0.00008%

The effect of these losses is so close to zero as to be entirely unresolvable on the ESU scale. Given this, the mitigation measures found on page 5, the knowledge that the information generated will be used to help manage ocean harvest regimes, and the fact that the researchers will continuously be on the lookout for listed fish to return to the river, the negative effects of this research will be negligible.

Study 2

Under Study 2, the researchers will sample capture, anesthetize, take tissue samples from and release up to 107 adult UCR spring chinook salmon. One fish (either natural or artificially propagated) may die as an inadvertent result of this process—though it is unlikely (they have lost one fish in the last five years of running this study). This means that a maximum of 0.08% of the expected adult spring chinook returns (1261 fish) may be killed—though the percentage is actually probably smaller than that for two reasons. First, the return numbers represent those

fish expected to make it all the way back to the upper Columbia. Therefore, any mortality that occurs at Bonneville Dam would be taken out of a larger number of returning fish because not all are expected to survive the journey upriver through several more dams and reservoirs. Second, in recent years the total returns to the upper Columbia have risen dramatically—with more than 14,000 returning in 2001 (NMFS 2003). But even if that one fish killed does represent the full 0.08%, it is impossible to determine what lasting negative effect that loss would have on the viability of the ESU as a whole. This is particularly true in that the information being gathered for the research is critical to determining run composition and age structure for the upriver stocks—information that is used to help adjust harvest management regimes and determine stock status on a yearly basis. Thus the (possible) loss of one adult UCR spring chinook is negligible.

Study 3

Under Study 3, CRITFC would annually capture, anesthetize, examine, take a scale sample from, and release adult, non-listed sockeye salmon at the Tumwater Dam on the Wenatchee river. Listed fish will not be targeted, but as many as 20 adult UCR steelhead may be captured and none will be killed. The captured steelhead will not be handled, and as soon as they have recovered from the anesthetic, they will be allowed to return to the river. It is not expected that the operations will have any lasting negative effect on the steelhead at all.

Permit 1410

Permit 1410 would allow the NWFSC to annually capture, handle, measure, and release adult, hatchery, UCR spring chinook, and lethally take juvenile UCR and steelhead (natural and artificially propagated) during a series of trawls in the nearshore environment off the mouth of the Columbia River. The NWFSC is requesting the following levels of take:

Table 17. Requested Take by ESU, Life Stage, Origin, and Activity for Permit 1410. (C=Capture, H=Handle, R=Release, LT=Lethal Take.)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Natural	LT	9	0
UCR Spr. Chinook	Juvenile	Hatchery	LT	2	0
UCR Steelhead	Juvenile	Natural	LT	1	0
UCR Steelhead	Juvenile	Hatchery	LT	2	0
UCR Spr. Chinook	Adult	Hatchery	C/H/R	2	0

This signifies that the following percentages of the out migration are likely to be affected by the research. The take numbers are placed in the context of the entire outmigration because the research would take place in the ocean environment and it is therefore impossible to determine where in the upper Columbia River the fish originated.

Table 18. Percentage of the 2003 Outmigration (Individualized for Natural and Hatchery Components) Likely to be Affected by Permit 1410.

ESU/Species	Life Stage	Origin	% Mortalities*
UCR Spr. Chinook	Juvenile	Natural	0.0004%
UCR Spr. Chinook	Juvenile	Hatchery	0.0002%
UCR Steelhead	Juvenile	Natural	0.0001%
UCR Steelhead	Juvenile	Hatchery	0.00008%

*Because all juveniles taken in the trawl would be killed, there is no reason to differentiate between the fish taken and the fish killed.

Because the two adult spring chinook salmon would not be killed (and it is entirely possible that not even two will be taken), it is not expected that the research will have anything more than a very temporary negative effect on the fish. On the ESU scale, the capture of these two fish cannot be differentiated from no effect at all. As to the juvenile fish, the numbers to be killed represent such small fractions of the outmigration that it would be impossible to resolve any negative effect on the local population scale, let alone the ESU as a whole. This is especially true when one considers the fact that a great deal of information will be taken from the dead fish and used (eventually) to develop a set of hydropwer management scenarios to benefit juvenile salmonid survival, growth, and health.

Permit 1421

Permit 1421 would allow the USFWS to annually capture, handle, and release juvenile and adult UCR spring chinook and steelhead (natural and artificially propagated). The researchers would use boat-and backpack electrofishing gear, some fyke nets and some baited minnow traps to capture the fish. The adult fish would not actually be physically handled. If they are encountered during the electrofishing operations, the equipment would immediately be shut off and the adults allowed to escape. The juveniles would be anesthetized, marked with a flourescent dye, sampled for stomach contents by gastric lavage, allowed to recover, and released. None of the captured adults fish are expected to die as a result of the research. The USFWS is requesting the following levels of take:

Table 19. Requested Take by ESU, Life Stage, Origin, and Activity for Permit 1421. (C=Capture, H=Handle, M=Mark, SS=Stomach Sample, R=Release.)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Natural	C/H/M/SS/R	8	1
UCR Spr. Chinook	Juvenile	Hatchery	C/H/M/SS/R	2	1
UCR Spr. Chinook	Adult	Natural	C/H/R	2	0
UCR Spr. Chinook	Adult	Hatchery	C/H/R	1	0
UCR Steelhead	Juvenile	Natural	C/H/M/SS/R	6	1
UCR Steelhead	Juvenile	Hatchery	C/H/M/SS/R	4	1
UCR Steelhead	Adult	Natural	C/H/R	2	0
UCR Steelhead	Adult	Hatchery	C/H/R	2	0

Because neither the three adult spring chinook salmon nor the four adult steelhead would be killed (and it is entirely possible that not even those numbers will be taken), it is not expected that the research will have anything more than a very temporary negative effect on the adult fish. On the ESU scale, the capture of these fish cannot be differentiated from no effect at all. The same is nearly true of the juvenile fish. At most, the research would kill a few ten-thousandths of a percent of the outmigration—and it is more likely that none at all would be killed. It is therefore impossible to determine what negative effect this will have on the ESU. Given this, and the fact that the research would generate important information about the use of certain pesticides in areas where anadromous fish are present, the possible negative effect of the research is entirely negligible.

Permit 1422

Permit 1422 would allow the USFS to annually capture, handle, and release juvenile UCR spring chinook and steelhead (natural and artificially propagated) in the Methow, Entiat, and Wenatchee subbasins of the upper Columbia River. The researchers would use hook-and-line angling, minnow traps, and some backpack electrofishing where the other methods would not work. The researchers will operate in different areas for year to year—based on the needs of differing forest management activities. It is therefore impossible to differentiate between natural and artificially propagated fish to be taken. In some years, they may operate largely above hatcheries, in others, largely below them. Thus the take is simply described as "juveniles."

The USFS is requesting the following levels of take:

Table 20. Requested Take by ESU and Activity for Permit 1422. (C=Capture, H=Handle, R=Release.)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Unknown	C/H//R	120	3
UCR Steelhead	Juvenile	Unknown	C/H/R	960	12

This means that the researchers would take as much as 0.003% and kill as much as 0.00007% of the spring chinook smolt run, and take 0.05% and kill as much as 0.0006% of the UCR steelhead outmigration. It is impossible to determine what negative effect killing a few ten-thousandths of a percent of the outmigration might have. Whatever that (minimal) effect is, the USFS will work to reduce it even further. They will use barbless, baitless hooks in the hook-and-line sampling, will check the minnow traps daily, and will only use electroshocking as a last resort and only on the lowest possible settings. The fish will handled as little as possible and released as soon as possible. Given these efforts, the small number of fish likely to be killed, and the fact that forest managers need the information the research will generate, the negative effects of the surveys are negligible at best.

Permit 1423

Permit 1423 would allow the USFWS to annually capture, handle, and release juvenile UCR spring chinook and steelhead. In addition, some of the captured fish would be sacrificed to gain information about disease presence and transmission in the populations.. The USFWS is requesting the following levels of take:

Table 21. Requested Take by ESU, Life Stage, Origin, and Activity for Permit 1423. (C=Capture, H=Handle, LT= Lethal take, R=Release.)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Natural	C/H/R	400	10
UCR Spr. Chinook	Juvenile	Hatchery	C/H/R	0	0
UCR Spr. Chinook	Juvenile	Natural	LT	180	0
UCR Spr. Chinook	Juvenile	Hatchery	LT	0	0
UCR Steelhead	Juvenile	Natural	C/H/R	200	10
UCR Steelhead	Juvenile	Hatchery	C/H/R	0	0
UCR Steelhead	Juvenile	Natural	LT	180	0
UCR Steelhead	Juvenile	Hatchery	LT	0	0

This means that the USFWS would capture, handle, and release some 0.02% of the natural UCR spring chinook outmigration and some 0.03% of the outmigrating (natural) UCR steelhead. In addition, they would kill a maximum of 0.008% of the natural spring chinook outmigration and 0.03% of the natural steelhead. In reality, though, the numbers for spring chinook are almost certainly smaller than those listed Much of the work would be done below Icicle Creek National Fish Hatchery, which means that a large but unknown percentage of the fish caught and sacrificed would be natural smolts derived from Carson Fish Hatchery stocks—which are not currently listed under the ESA. Furthermore, the numbers represent an absolute maximum for the first year. Once the data starts coming in, it is entirely possible (even likely) that fewer fish will have to sacrificed.

In any case, the amount of lethal take is very small and the USFWS will work to decrease the lethal take over time. It is also important to keep in mind the fact that the 0.03% of the natural steelhead and the 0.008% of the natural chinook represent, by definition, only the natural components of those ESUs. If the listed hatchery components are added in, the loss percentages are cut to 0.005% of the spring chinook ESU and 0.01% of the steelhead ESU. It cannot be determined what lasting negative effect the loss of, at most, one-hundredth of a percent of the outmigrating fish would have; especially given the fact that these fish will generate important information on pathogen presence in the upper Columbia River—information that may well be used to protect a great many more fish in the future.

Research Action 1

Under Research Action 1, the CRITFC would annually capture, handle, and release juvenile UCR spring chinook and steelhead. The fish would be captured with an 8-foot rotary screw trap located near the mouth of the Methow River. The researchers are proposing the following take levels:

Table 22. Requested take by ESU, Origin, and Activity for Research Action 1 (C=Capture, H=Handle, R=Release.)

ESU/Species	Life Stage	Origin	Take Activity	Requested Take	Unintentional Mortality
UCR Spr. Chinook	Juvenile	Natural	C/H/R	12,305	123
UCR Spr. Chinook	Juvenile	Hatchery	C/H/R	55,000	550
UCR Steelhead	Juvenile	Natural	C/H/R	23,444	235
UCR Steelhead	Juvenile	Hatchery	C/H/R	8,400	84

To put these take levels into perspective, it is necessary to look at their impact in terms of the Methow/Okanogon portion of the UCR spring chinook and steelhead runs, the hatchery/natural origins, and each ESU as a whole. The following two tables do this.

Table 23. Research Action 1—Requested Juvenile Take displayed as Percentages of Natural/Hatchery Origin and the Methow/Okanogon (M/O) System Runs.*

ESU/Species	Origin	% Origin Taken*	% Origin Dead**	% M/O Run Taken	% M/O Run Dead
UCR Spr. Chinook	Natural	0.5%	0.005%	1.4%	0.01%
UCR Spr. Chinook	Hatchery	4.3%	0.04%	7.7%	0.08%
UCR Steelhead	Natural	3.5%	0.03%	5.8%	0.06%
UCR Steelhead	Hatchery	0.7%	0.007%	1.5%	0.01%

*See Table 7 for the expected outmigration numbers for the M/O system.
**In this instance, the percent of the origin is for *all* the natural/hatchery fish in the ESU.

Table 24. Requested Take Displayed as a Percentage of Each ESU.*

ESU/Species	% To be Captured, Handled, and Released	Percentage of Unintentional Mortality
UCR Spr. Chinook	1.8%	0.02%
UCR Steelhead	1.7%	0.02%

*See Table 3 for ESU-wide outmigration numbers.

Thus the proposed research will have a very small—even negligible—negative effect on each ESU. Nonetheless, the researchers will work to reduce those impacts even further. To minimize predation by larger fish on the smaller fish, fir limbs would be placed in the live box (holding area) to provide hiding cover. The fish would be dip-netted from the trap and handled with wool gloves soaked in a chemical that will help prevent injury and mucous removal. After the fish are measured (a process taking a few tens of seconds per fish) they would be placed in a recovery tank and allowed to volitionally return to the river. Moreover, the trap itself would be removed from the river after hatchery releases upstream to avoid sampling larger numbers of listed fish.

Finally, the proposed research and its results will be coordinated with the Upper Columbia Regional Technical Team (RTT)—a group embarking on an extensive salmonid monitoring effort in the area. This will ensure that efforts are not duplicated and that the data collected will be of maximum benefit to the region as a whole.

Cumulative Effects

Cumulative effects are those effects of future Tribal, state, local or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. For the purpose of this analysis, the action area is that part of the UCR Basin described in the Description of the Proposed Actions section above. Future Federal actions, including the operation of hydropower systems, hatcheries, fisheries, and land management activities will be reviewed through separate section 7 consultation processes. Non-Federal actions that require authorization under section 10 of the ESA, and that are not included within the scope of this consultation, will be evaluated in separate consultations.

Future Tribal, state, and local government actions will likely to be in the form of legislation, administrative rules or policy initiatives. Government and private actions may include changes in land and water uses, including ownership and intensity, any of which could impact listed species or their habitat. Government actions are subject to political, legislative, and fiscal uncertainties. These realities, added to geographic scope of the action area which encompasses numerous government entities exercising various authorities and the many private landholdings, make any analysis of cumulative effects difficult and frankly speculative. This section identifies representative actions that, based on currently available information, are reasonably certain to

occur. It also identifies some goals, objectives, and proposed plans by government entities, however, NMFS is unable to determine at this point in time whether any proposals will in fact result in specific actions.

State Actions

Each state in the Columbia River Basin administers the allocation of water resources within its borders. Most streams in the basin are overappropriated even though water resource development has slowed in recent years. Washington closed the mainstem Columbia River to new water withdrawals, and is funding a program to lease or buy water rights. If carried out over the long term this might improve water quantity. The state governments are cooperating with each other and other governments to increase environmental protections, including better habitat restoration, hatchery, and harvest reforms. NMFS also cooperates with the state water resource management agencies in assessing water resource needs in the basin, and in developing flow requirements that will benefit listed fish. During years of low water, however, there could be insufficient flow to meet the needs of the fish. These government efforts could be discontinued or even reduced, so their cumulative effects on listed fish is unpredictable.

The state of Washington has various strategies and programs designed to improve the habitat of listed species and assist in recovery planning, including the Salmon Recovery Planning Act, a framework for developing watershed restoration projects. The state is developing a water quality

improvement scheme through the development of TMDLs (total maximum daily loads). These programs could benefit the listed species if implemented and sustained.

In the past, Washington's economy was heavily dependent on natural resources, with intense resource extraction activity. The state's economy has changed over the last decade and it is likely to continue changing—with less large scale resource extraction, more targeted extraction methods, and significant growth in other economic sectors. Growth in new businesses is creating urbanization pressures with increased demands for buildable land, electricity, water supplies, waste disposal sites, and other infrastructure. Economic diversification has contributed to population growth and movement in the states, a trend likely to continue for the next few decades. Such population trends will place greater demands in the action area for electricity, water, and buildable land; will affect water quality directly and indirectly; and will increase the need for transportation, communication, and other infrastructure development. The impacts associated with economic and population demands will affect habitat features, such as water quality and quantity, which are important to the survival and recovery of the listed species. The overall effect is likely to be negative, unless carefully planned for and mitigated.

Some of the state programs described above are designed to address these impacts. Also, Washington enacted a Growth Management Act to help communities plan for growth and

address growth impacts on the natural environment. If the programs continue they may help lessen some of the potential adverse effects identified above.

Local Actions

Local governments will be faced with similar but more direct pressures from population growth and movement. There will be demands for intensified development in rural areas as well as increased demands for water, municipal infrastructure, and other resources. The reaction of local governments to such pressures is difficult to assess at this time without certainty in policy and funding. In the past, local governments in the action area generally accommodated additional growth in ways that adversely affected listed fish habitat. Also there is little consistency among local governments in dealing with land use and environmental issues so that any positive effects from local government actions on listed species and their habitat are likely to be scattered throughout the action area.

In Washington, local governments are considering ordinances to address aquatic and fish habitat health impacts from different land uses. These programs are part of state planning structures. Some local government programs, if submitted, may qualify for a limit under the NMFS' ESA section 4(d) rule which is designed to conserve listed species. Local governments also may participate in regional watershed health programs, although political will and funding will determine participation and therefore the effect of such actions on listed species. Overall, without comprehensive and cohesive beneficial programs and the sustained application of such

programs, it is likely that local actions will not have measurable positive effects on listed species and their habitat, but may even contribute to further degradation.

Tribal Actions

Tribal governments will continue to participate in cooperative efforts involving watershed and basin planning designed to improve fish habitat. The results from changes in Tribal forest and agriculture practices, in water resource allocations, and in changes to land uses are difficult to assess for the same reasons discussed under State and Local Actions. The earlier discussions related to growth impacts apply also to Tribal government actions. Tribal governments will need to apply comprehensive and beneficial natural resource programs to areas under their jurisdiction to produce measurable positive effects for listed species and their habitat.

Private Actions

The effects of private actions are the most uncertain. Private landowners may convert current use of their lands, or they may intensify or diminish current uses. Individual landowners may voluntarily initiate actions to improve environmental conditions, or they may abandon or resist any improvement efforts. Their actions may be compelled by new laws, or may result from growth and economic pressures. Changes in ownership patterns will have unknown impacts. Whether any of these private actions will occur is highly unpredictable, and the effects even more so.

Summary

Non-Federal actions are likely to continue affecting the listed species. The cumulative effects in the action area are difficult to analyze considering the geographic landscape of this opinion, the political variation in the action area, the uncertainties associated with government and private actions, and the changing economies of the region. Whether these effects will increase or decrease is a matter of speculation; however, based on the trends identified in this section, the adverse cumulative effects are likely to increase. Although state, Tribal, and local governments have developed plans and initiatives to benefit listed fish, they must be applied and sustained in a comprehensive way before NMFS can consider them "reasonably foreseeable" in its analysis of cumulative effects.

Integration and Synthesis of Effect

The vast majority (more than 97% in all cases) of the UCR fish that will be captured, handled, tagged, etc., during the course of the proposed research are expected to survive with no long-term effects. Moreover, all the capture, handling, and holding methods will be minimally intrusive and of short duration. Because so many of the captured fish are expected to survive the research actions and so few (a maximum of 4.8%—see Table 27) of the total UCR fish outmigration will be affected in even the slightest way, it is likely that no adverse effects will result from these actions at either the population or the ESU level. Therefore, adverse effect must be expressed in terms of the individual fish that may be killed during the various permitted activities. The following tables summarize these effects for each proposed permit and Research Action 1.

Table 25. Requested Take of Endangered UCR Spring Chinook

	Adult				Juvenile			
Permit	HANDLE		MORTALITY		HANDLE		MORTALITY	
Action	C,H,R	C,T/M, S, R	INTENTIONAL	UNINTENTIONAL	C,H,R	C,T/M, S,R	INTENTIONAL	UNINTENTIONAL
1114	0	0	0	0	20,621	4,321	0	697
1119	50	0	0	1	16,000	7,000	0	210
1156	8		0	0	70	0	0	2
1194	0	10		1	0	0	0	0
1290	0	0	0	0	4	0	4	0
1291	0	0	0	0	7,764	598	0	152
1322	0	0	0	0	0	0	30	0
1335	0	0	0	0	90	0	0	2
1366	0	0	0	0	920	3	9	27
1379	0	107	0	1	200	0	0	4
1410	2	0	0	0	11	0	11	0
1421	3	0	0	0	0	10	0	2
1422	0	0	0	0	120	0	0	3
1423	0	0	0	0	400	0	180	10
RA-1	0	0	0	0	67,305	0	0	673
TOTALS	63	117	0	3	113,505	11,932	234	1,782

Key: C,H,R = Capture, Handle, Release; C, T/M, S, R = Capture, Tag/mark, Sample, Release.

Table 26. Requested Annual Take of Endangered UCR Steelhead

	Adult				Juvenile			
Permit	HANDLE		MORTALITY		HANDLE		MORTALITY	
Action	C,H,R	C,T/M, S, R	INTENTIONAL	UNINTENTIONAL	C,H,R	C, T/M, S, R	INTENTIONAL	UNINTENTIONAL
1114	80	0	0	2	27,855	4,000	0	530
1119	50	0		1	17,000	6,500	0	335
1156	10	0	0	0	84	0	0	2
1194	0	14	0	1	0	0	0	0
1290	0	0	0	0	13	0	0	0
1291	0	0	0	0	11,892	1,483	0	268
1335	0	0	0	0	300	0	0	6
1366	0	0	0	0	281	189	9	35
1379	20	0	0	0	50	0	0	2
1410	0	0	0	0	0	0	3	0
1421	4	0	0	0	0	10	0	2
1422	0	0	0	0	960	0	0	12
1423	0	0	0	0	200	0	180	0
RA-1	0	0	0	0	31,844	0	0	319
TOTALS	164	14	0	4	90,479	12,182	192	1,511

Key: C,H,R = Capture, Handle, Release; C, T/M, S, R = Capture, Tag/mark, Sample, Release.

Table 27. Maximum Annual Take Percentages for UCR Spring Chinoook and Steelhead

	Adult				Juvenile			
	%HANDLE		%MORTALITY		%HANDLE		%MORTALITY	
ESU	C,H,R	C,T/M, S, R	INTENTIONAL	UNINTENTIONAL	C,H,R	C,T/M, S, R	INTENTIONAL	UNINTENTIONAL
Chinook	4.9%	9.3%	0	0.2%	3.0%	0.3%	0.006%	0.05%
Steelhead	2.1%	0.2%	0	0.05%	4.8%	0.6%	0.01%	0.08%

Thus all the activities, when taken together, would kill, at most, a few hundredths of a percent of the adult or juvenile UCR spring chinook or steelhead—with the exception of adult UCR spring chinook, where the activities may unintentionally kill two-tenths of a percent of that run. This is unlikely, however, in that no adult UCR spring chinook are actually expected to be killed in any

given year. Furthermore, it is important to keep in mind the fact that the adult percentages are based on recent 5-year geometric means for returns, and the chances are very good that the returns will be a great deal higher in the future. The hatchery supplementation programs in the UCR appear to be succeeding, and many thousands of fish are now returning where only a few hundred did so just a few sort years ago. But even if the runs do not increase, the activities, in total, may possibly kill three adult chinook and four adult steelhead in a worst-case scenario and they are more likely to kill none. The losses of these fish would undoubtedly have a small impact on the ESUs, but that impact is discountable in view of the beneficial information the research will generate and the fact that the loss of so few fish would in no way cause lasting harm the health of either ESU.

As Table 27 illustrates, the total amounts of estimated lethal take for all research would equal 0.06% of the UCR spring chinook outmigration and 0.09% of the steelhead outmigration. However, and for a number of reasons, those percentages are in actuality probably much smaller. First, as stated earlier in the Opinion (footnote to Table 3), the outmigration for 2003 is actually larger than the conservative estimates used here. Second, it is important to remember that every estimate of lethal take for the proposed studies has purposefully been inflated to account for potential accidental deaths and it is therefore very likely that fewer juveniles will be killed by the research than stated in Table 25 and 26—possibly many fewer. Third, some of the studies will specifically affect steelhead and chinook in the smolt stage, but others will not. These latter studies are described as affecting "juveniles," which means they may affect steelhead yearlings, parr, or even fry: life stages represented by many more individuals than reach the smolt stage—perhaps as much as an order of magnitude more. Therefore the 0.05% and 0.09% figures were derived by (a) underestimating the actual number of outmigrating UCR spring chinook and steelhead smolts, (b) overestimating the number of fish likely to be killed, and (c) treating each dead juvenile fish as a smolt when some of them clearly won't be. Thus the actual numbers of juvenile UCR steelhead and chinook the research is likely to kill are undoubtedly smaller than the stated figures.

But even if the entire 0.05% of the juvenile UCR spring chinook and 0.09% of the steelhead were killed, and they were *all* treated as smolts, it would be very difficult to translate those numbers into actual effects on the species. Even if the subject were one or two adults killed out of a population of two thousand (0.05% is another way of expressing the fraction "one two-thousandth"), it would be hard to resolve an adverse effect. And in this instance, that effect is even smaller because the loss of a smolt is not equivalent to the loss of an adult in terms of species survival and recovery. This is due to the fact that a great many smolts die before they can mature into adults—a good conservative estimate would be that 90% of outmigrating salmonid smolts in do not survive to return as adults (NMFS 2002). This means that some 90% of the 0.05% and 0.09% figures would likely be killed during the natural course of events. Therefore the research, even in the worst possible scenario, would kill likely the (maximum) equivalent of one or two adults out of twenty thousand—and that small an amount of loss would have a negligible adverse effect on either ESU.

Nonetheless, regardless of their magnitudes, the negative effects associated with the proposed permits (in terms of both juvenile and adult losses) must be juxtaposed with the benefits to be derived from the research (see descriptions of the individual permits). Those benefits range from researching ways to restore salmon back to their native streams (Permit 1119) to helping determine better ways to help the fish survive downstream passage through the dams (Permit 1291). In all, the fish will derive some benefit from every permit considered in this Opinion. The amount of benefit will vary, but in some cases it likely be significant. Therefore, in deciding whether to issue the permits considered here, NMFS must compare the tangible benefits they will produce (some of which are potentially significant) with the negligible adverse effects they will cause. Moreover, NMFS must weigh similar factors (benefit versus adverse effect) when deciding whether the contemplated actions will appreciably reduce the likelihood of the UCR spring chinook and steelhead's survival and recovery—the critical determination in issuing any biological opinion.

CONCLUSIONS

After reviewing the current status of the endangered species that are the subject of this consultation, the environmental baselines for the action areas, the effects of the proposed section 10(a)(1)(A) permit actions, and cumulative effects, it is NMFS' biological opinion that issuance of the permit actions, as proposed, and the funding of the proposed activities by Federal agencies, if applicable, are not likely to jeopardize the continued existence of endangered UCR spring chinook salmon or endangered UCR steelhead or destroy or adversely modify their habitats.

Coordination with the National Ocean Service

None of the activities contemplated in this Biological Opinion will be conducted in or near a National Marine Sanctuary. Therefore, these activities will not have an adverse effect on any National Marine Sanctuary.

INCIDENTAL TAKE STATEMENT

Section 9 and the regulations implementing section 4(d) of the ESA prohibit any take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of ESA-listed species without a specific permit or exemption. When a proposed Federal action is found to be consistent with Section 7(a)(2) of the ESA (i.e., the action is found not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat) and that action may incidentally take individuals of an listed species, NMFS will issue an Incidental Take Statement (ITS) specifying the impact of any incidental take of the endangered or threatened species.

The ITS provides reasonable and prudent measures that are necessary to minimize impacts, and sets forth terms and conditions with which an action agency or permit applicant must comply in order to implement the reasonable and prudent measures. "Incidental" take is that which occurs while an agency or an applicant is engaged in an otherwise lawful activity; it is exempted from the take prohibition by section 7(o) of the ESA, but only if that take is in compliance with the specified terms and conditions. The measures described below are non-discretionary and must be undertaken by NMFS for the exemption in section 7(o)(2) to apply. If NMFS (1) fails to cause the terms and conditions to be implemented or (2) fails to require the action agency or applicant to adhere to the enforceable terms and conditions of this ITS, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental takes, the action agency or applicant must report the progress of its actions and their impacts on the species to NMFS as specified in this ITS [50 CFR 402.14(I)(3)].

Amount or Extent of Incidental Take

The annual incidental takes of endangered UCR spring chinook and steelhead can be specified for only one action within the scope of this consultation—CRITFC's Research Action 1. The scientific research activities conducted by the Columbia River Inter-Tribal Fish Commission (CRITFC) may incidentally take a maximum annual total of (a) 67,305 juvenile UCR spring chinook, 673 of which may be killed as a result of the incidental take, and (b) 31,844 juvenile UCR steelhead, 319 of which may be killed as a result of the incidental take. In the accompanying biological opinion, NMFS determined that this level of take is not likely to jeopardize UCR spring chinook or steelhead.

If this specified maximum incidental take level is reached or exceeded, NMFS may cause the scientific research activities to cease until this consultation is reinitiated or a new consultation is completed.

Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of taking listed species. The action agency is directed to (a) use all possible care to minimize the effects of the operations, (b) use experienced staff for all fish sampling operations, (c) cooperate with other researchers during this sampling and to report the results of the sampling to NMFS and all other interested parties, and (d) demonstrate that the project is fulfilling its purpose of generating important data on summer chinook in the upper Columbia River.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the CTWSRO must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring actions. These terms and conditions are non-discretionary.

1. The researcher must ensure that listed species are taken only at the levels, by the means, in the areas and for the purposes stated in the permit application, and according to the terms and conditions in this permit.

2. The researcher must not intentionally kill or cause to be killed any listed species unless the permit specifically allows intentional lethal take.

3. The researcher must handle listed fish with extreme care and keep them in cold water to the maximum extent possible during sampling and processing procedures. When fish are transferred or held, a healthy environment must be provided; e.g., the holding units must contain adequate amounts of well-circulated water. When using gear that captures a mix of species, the researcher must process listed fish first to minimize handling stress.

4. The researcher must stop handling listed juvenile fish if the water temperature exceeds 70 degrees Fahrenheit at the capture site. Under these conditions, listed fish may only be visually identified and counted.

5. If the researcher anesthetizes listed fish to avoid injuring or killing them during handling, the fish must be allowed to recover before being released. Fish that are only counted must remain in water and not be anesthetized.

6. If the researcher incidentally captures any listed adult fish while sampling for juveniles, the adult fish must be released without further handling and such take must be reported.

7. The researcher must exercise care during spawning ground surveys to avoid disturbing listed adult salmonids when they are spawning. Researchers must avoid walking in salmon streams whenever possible, especially where listed salmonids are likely to spawn. Visual observation must be used instead of intrusive sampling methods, especially when just determining presence of anadromous fish.

8. The researcher must obtain approval from NMFS before changing sampling locations or research protocols.

9. The researcher must notify NMFS as soon as possible but no later than 2 days after any authorized level of take is exceeded or if such an event is likely. The researcher must submit a written report detailing why the authorized take level was exceeded or is likely to be exceeded.

10. The researcher must allow any NMFS employee or representative to accompany field personnel while they conduct the research activities.

11. The researcher must allow any NMFS employee or representative to inspect any records or facilities related to the permit activities.

12. The researcher must obtain all other Federal, state, and local permits/authorizations needed for the research activities.

13. On or before January 31st of every year, the researcher must submit to NMFS a post-season report in the prescribed form describing the research activities, the number of listed fish taken and the location, the type of take, the number of fish intentionally killed and unintentionally killed, the take dates, and a brief summary of the research results.

14. If the researcher violates any of these terms or conditions they will be subject to any and all penalties provided by the ESA.

It should be noted that in this instance "researcher" means CRITFC or any of its employees, contractors, or agents.

Conservation Recommendations

Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to develop additional information, or to assist Federal agencies in complying with their obligations under section 7(a)(1) of the ESA. NMFS believes the following conservation recommendation is consistent with these obligations, and therefore should be implemented:

NMFS shall monitor actual annual takes of ESA-listed fish species—as provided to NMFS in annual reports or by other means—and shall adjust annual permitted take levels if they are deemed to be excessive or if cumulative take levels are determined to operate to the disadvantage of the ESA-listed species.

Reinitiation of Consultation

Consultation must be reinitiated if: The amount or extent of the specified annual take is exceeded or is expected to be exceeded; new information reveals effects of the actions that may affect the ESA-listed species in a way not previously considered; a specific action is modified in a way that causes an effect on the listed species that was not previously considered; or a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

MAGNUSON-STEVENS ACT ESSENTIAL FISH HABITAT CONSULTATION

"Essential fish habitat" (EFH) is defined in section 3 of the Magnuson-Stevens Act (MSA) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS interprets EFH to include aquatic areas and their associated physical, chemical, and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem. EFH has been designated for Pacific salmon, groundfish, and coastal pelagic species. For information on EFH for these species, please see this website: http://www.nwr.noaa.gov/1habcon/habweb/msa.htm.

The MSA and its implementing regulations at 50 CFR 600.920 require a Federal agency to consult with NMFS before it authorizes, funds, or carries out any action that may adversely affect EFH—in this case, EFH for Pacific salmon, groundfish, and coastal pelagic species. The purpose of consultation is to develop a conservation recommendation(s) that addresses all reasonably foreseeable adverse effects to EFH. Further, the action agency must provide a detailed, written response to NMFS within 30 days of receiving an EFH conservation recommendation. The response must include measures proposed by the agency to avoid, minimize, mitigate, or offset the impact of the activity on EFH. If the response is inconsistent with NMFS' conservation recommendation the agency must explain its reasons for not following the recommendation.

However, in this instance, no conservation recommendations are necessary. As the Biological Opinion above describes, the proposed research actions are not likely, singly or in combination, to adversely affect the habitat upon which Pacific salmon, groundfish, and coastal pelagic species, depend. All the actions are of limited duration, minimally intrusive, and are entirely discountable in terms of their effects, short-or long-term, on any habitat parameter important to the fish.

The action agencies must reinitiate EFH consultation if plans for these actions are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for the EFH conservation recommendations (50 CFR Section 600.920(k)).

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